

TRANSCRIPT OF RECORD.

SUPREME COURT OF THE UNITED STATES.

OCTOBER TERM, 1901.

No. 239.

THE UNITED STATES, APPELLANT,

VS.

THE RIO GRANDE DAM AND IRRIGATION COMPANY
ET AL.

APPEAL FROM THE SUPREME COURT OF THE TERRITORY OF NEW
MEXICO.

FILED JANUARY 24, 1902.

(1902.)

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1 Be it remembered that heretofore, on, to wit, at a regular term of the supreme court of the Territory of New Mexico, begun and held at Santa Fe, the seat of government, on the first Wednesday after the first Monday in January, the same being the third day of January, A. D. 1900, on the twenty-sixth day thereof, the same being the 1st day of February, A. D. 1900, the following, among other proceedings, were had in the case where the United States of America was appellant and the Rio Grande Dam & Irrigation Company et al. were appellees, as follows, to wit:

THE UNITED STATES OF AMERICA,	} No. 879. Appeal from third judicial district court.
appellant,	
<i>vs.</i>	
THE RIO GRANDE DAM & IRRIGATION Company et al., appellees.	

Come now the United States attorney, W. B. Childers, esq., and moves the court that they be allowed to docket the above-entitled cause as of this term; and the court being sufficiently advised in the premises allows said motion. It is therefore considered and adjudged by the court that the case of The United States of America vs. The Rio Grande Dam & Irrigation Company be and the same hereby is ordered docketed as of this term, and that the same will be set for hearing as soon as the transcript can be prepared.

And afterwards, on, to wit, on the thirty-third day of the said regular term, the same being Friday, the 9th day of February, the following, among other proceedings, were had, as follows, to wit:

THE UNITED STATES OF AMERICA,	} No. 879. Appeal from third judicial district court.
appellant,	
<i>vs.</i>	
THE RIO GRANDE DAM & IRRIGATION Company et al., appellees.	

It is ordered by the court that this cause be, and the same hereby is, set for hearing for Tuesday, the first day of May, A. D. 1900.

2 And afterwards, on, to wit, the first day of May, A. D. 1900, there was filed in the office of the clerk of the supreme court of the Territory of New Mexico a transcript of record, which said transcript of record is in words and figures as follows, to wit:

United States of America, Territory of New Mexico, third judicial district court.

Be it remembered that on the 15th day of July, A. D. 1899, there was filed in the United States court of the third judicial district of the Territory of New Mexico a mandate issued out of the supreme court of the Territory of New Mexico, which said mandate is in words and figures as follows, to wit:

The Territory of New Mexico to the district court sitting within and for the county of 3rd judicial district, greeting:

Whereas, in a certain cause lately pending before you, wherein The United States of America was appellant and The Rio Grande Dam and

Irrigation Company and The Rio Grande Irrigation and Land Company, limited, were appellees, by your consideration in that behalf, judgment was entered against the said appellant; and

Whereas the said cause and judgment were afterwards brought into our supreme court for review by appeal, whereupon such proceedings were had in said supreme court that at the July, 1897, term thereof, on the 25th day of August, 1897, it was considered that the judgment aforesaid, by you in form given, be affirmed, and that injunction heretofore issued be dismissed; and

Whereas said cause and judgment was afterwards taken by appeal to the Supreme Court of the United States, where by consideration of said court at its October, 1898, term it was considered that the judgment aforesaid be reversed and that said cause be remanded to this court with instructions to set aside the decree of dismissal and order an inquiry into the question whether the intended acts of the defendants in the construction of a dam and the appropriation of the waters of the Rio Grande will substantially diminish the navigability of that stream

3 within the limits of the present navigability, and if so to enter a decree restraining those acts to the extent that they will so diminish.

Now, therefore, you are hereby commanded to reinstate said cause upon your docket and set aside said decree of dismissal therein, and to reinstate the bill of complaint, and to proceed in accordance with the terms of said mandate of the Supreme Court of the United States.

Witness, the Honorable William J. Mills, chief justice of the supreme court of the Territory of New Mexico, and the seal of said court, this 14th day of July, A. D. 1899.

[SEAL.]

(Signed) JOSE D. SENA, Clerk.

And be further remembered that afterwards, to wit, on the 5th day of August, A. D. 1899, there was entered of record in the United States court of the third judicial district of the Territory of New Mexico an order, which said order is in words and figures as follows, to wit:

UNITED STATES OF AMERICA,
Third judicial district court,

In the district court of the third judicial district of the Territory of New Mexico.

UNITED STATES OF AMERICA, PLAINTIFF,	} No. 1243, civil.
<i>vs.</i>	
THE RIO GRANDE DAM & IRRIGATION COMPANY et als., defendants.	

This cause coming on for hearing upon application of the defendants herein, and notice to the United States, to set the same for final hearing upon evidence taken under the mandate of the supreme court of New Mexico, and the respective parties appearing by W. B. Childers, esq., attorney for the United States, and S. B. Newcomb, esq., W. A. Hawkins, esq., and A. B. Fall, esq., for the defendants, it is ordered, adjudged, and decreed by the court that the said cause be, and the same is hereby,

set for final hearing on Wednesday, the first day of November, A. D. 1899, at Las Cruces, New Mexico.

Done at chambers at Las Cruces, N. M., this 5th day of August, A. D. 1899.

(Signed) FRANK W. PARKER, *Judge, &c.*

And be further remembered that afterwards, to wit, on the 17th day of October, A. D. 1899, there was filed in the said United States district court a motion for the continuance of this cause, and an affidavit in support of said motion, which said motion is in words and figures, as follows, to wit:

United States of America, Territory of New Mexico, third judicial district.

In the district court of the United States for the third judicial district of the Territory of New Mexico, held for the trial of causes arising under the Constitution and laws of the United States, at the October, A. D. 1899 term thereof.

THE UNITED STATES OF AMERICA, PLAINTIFF,	} No. 1243, injunction.
<i>vs.</i>	
THE RIO GRANDE DAM & IRRIGATION COM-	}
pany et als., defendants.	

Motion for continuance.

Now comes the said United States of America, plaintiff herein, by William B. Childers, her attorney, and move the court for a further continuance and extension of time for the hearing of the above-entitled cause, from and beyond the first day of November, A. D. 1899, for which time the said hearing of this cause has been ordered by this court, for and to the fifth day of February, A. D. 1900, or such other reasonable time as the court may deem seasonable and proper after the hearing of this motion; and for the grounds of said motion said plaintiff show the following, to wit:

That said plaintiff's have been and are unable to collect and present to this honorable court the necessary and proper evidence and oral testimony from witnesses for a proper presentation of the plaintiffs' side of said cause, notwithstanding having used due diligence to that end, all of which will more fully appear from an affidavit hereto attached and made a part of this motion in support thereof, and to which the court is respectfully referred.

The plaintiffs, as a condition for the extension of time for the taking of testimony for the trial of said cause, have offered and hereby offer to enter into any proper and reasonable stipulation to enable the supreme court of the Territory of New Mexico to take jurisdiction of any appeal which may be taken by either party at its ensuing January term, and dispose of the cause during said term, or at any adjourned session of the same.

(Signed) W. B. CHILDERS,
United States Attorney for the District of New Mexico.

And said affidavit is in words and figures as follows, to wit:

TERRITORY OF NEW MEXICO, County of Dona Ana, ss:

Before me personally appeared Marsden C. Burch, who, being by me first duly sworn, upon his oath deposes and says:

That he is an attorney at law, and as such connected with the Department of Justice of the United States; that he is acquainted with many of the facts and circumstances connected with the above-entitled cause; that some time during the latter part of June, in the current year, as near as affiant can recollect, the Attorney-General of the United States directed affiant to assume the position of counsel in the above-entitled cause, and take charge of so much thereof as might afterwards be determined upon between the United States attorney for the district of New Mexico and this affiant.

Affiant further says that he immediately obtained files and correspondence of the Department of Justice relating to said cause, and after reading the same in as thorough a manner as possible he conferred with other officers of the Department, and particularly with the
6 Solicitor-General's Office, and procured directions to be issued to the clerk of the Supreme Court of the United States tending to have the cause remanded to the supreme court of the Territory of New Mexico; and further asked that the United States attorney for the district of New Mexico be requested to take earliest possible steps to have the cause remanded from the supreme court of the Territory of New Mexico to this honorable court; that he is informed by the said United States attorney, and verily believes that he received such directions as hereinbefore mentioned, and in accordance therewith used the telegraph to procure the supreme court of the Territory of New Mexico to remand the cause to this honorable court before its adjournment; and that this affiant believes that by such directions so given, or caused to be given by him, that the ordinary course of the proceedings before mentioned, to return to this honorable court the said cause, were expedited by a very considerable period of time, probably several months; that the course of this affiant in such respect was in accordance with the general order orally given to him by the Attorney-General of the United States when said cause was so entrusted to him, which were in terms substantially this: That he should lose no time in the preparation and trial of this cause, and that he should give it right of way above any and all other business entrusted to him.

This affiant further says that the magnitude and importance of this cause, in the opinion of the Attorney-General, as expressed to affiant, and in his own opinion, was such as to require a careful examination of the subject-matter therein involved, as well as in the reports of the various Departments of the Government bearing thereon, as by personal interviews with men of actual knowledge of the facts, and others eminent in the profession of engineering, and that for such reasons he at once began to give his time and attention to the preparation of the cause for trial, even working out of hours during the heated season and without taking the usual summer vacation allowed in the Department of Justice; that he visited various leading cities of the United States for the purpose of having interviews with eminent professional men presumed

to have opinions of value in respect to the subject-matter of the cause, and corresponded, in the name of the Attorney-General and personally, quite extensively with men in different parts of the country whom he was unable to see; that at the same time he was informed and advised by persons having a general acquaintance with the localities along the stream, and a better acquaintance than himself, that it would be difficult, if not injurious to his health, to attempt, during the heated season of July and August, and, perhaps, early September, to visit portions of the Territory in which it seems important to make investigations, but that during the early part of September he came to the Territory of New Mexico, and there had an interview with the United States attorney for said district and with professional men having peculiar knowledge in respect to the merits of this cause, and was then compelled to return to Washington without further action within the Territory; that to the best of his ability to judge he has spared no time or effort which might be reasonably and properly directed to the preparation of this cause for trial at the earliest possible opportunity; that he has procured the services of another assistant, who for many years has been acquainted along the lower part of said river and who speaks the Spanish language fluently, to aid him in procuring the necessary testimony and evidence to present to this honorable court upon the trial of said cause; that he has taken pains to arrange with different parties for stenographic and other assistance, if the same should be necessary, and, in short, done everything that he has been advised and has, in accordance with such advice, believed to be necessary and proper for the preparation of said cause for trial at the earliest reasonable opportunity, but that he has become fully satisfied and verily believes, and so represents to this honorable court, that it would be an impossibility to properly and reasonably present to said court the plaintiff's case within the time limited by the rules and practice of the court and set down for trial as aforesaid.

Affiant further says that it will be necessary, and it is the intention of said plaintiffs, to present, as far as possible, witnesses who shall testify in open court from various localities, but that there will be a considerable number of witnesses whose attendance in open court can not be procured under the rules and practice of the court, but whose depositions must be obtained to read upon such trial; that so far as he is advised and verily believes they reside in several different States, and some of them reside within the adjoining Republic of Mexico; that in his judgment, in properly procuring the necessary testimony of such parties, and in procuring and compiling for presentation to this court documentary evidence, it is necessary that there should be a considerable extension of time for the trial of said cause, and that this is particularly true from the fact that the history of the Rio Grande River, as far as possible, from its mouth to its source, back for a period of many years, involving its navigation for commerce, as well as its use for the purpose of irrigation, must be prepared and furnished to this honorable court, and, in addition to its history, the general size, capacity, and condition of said river for the same general period must be shown to the court, and that upon hypothetical questions, the foundations for which testimony and evidence shall first be taken, expert witnesses will be asked upon the part of the Government to testify as to their opinions, and that this will involve

an unusual amount of labor and consequently a considerable amount of time not common to ordinary cases; that, as before mentioned, this affiant is advised and verily believes that the case is of unusual magnitude and importance, not only as bearing upon the commerce and navigation of the Rio Grande River, but the irrigation along the same, and that the questions involved in this issue of fact, as applied to the decision pronounced in this cause by the Supreme Court of the United States, all tend to render the cause one of national importance, and the shortening of the time for the presentation of the case beyond such reasonable limit as will be just to both parties will work harm and injury rather than concerning the ends of justice.

Affiant further states that he has heard read the above motion, in support of which this affidavit is made, and that the same has been made at his special instance and request by the attorney of record in said cause, and that same is not made for delay merely, but that the ends of justice may be conserved thereby.

(Signed)

MARSDEN C. BURCH.

Subscribed and sworn to before me this 17th day of October, A. D. 1899.

[SEAL.]

(Signed) JAMES P. MITCHELL,

Clerk of the Third Judicial District Court.

9 And be it further remembered that afterwards, to wit, on the 18th day of October, A. D. 1899, in the said United States district court, the following proceedings were had and entered of record, to wit:

UNITED STATES OF AMERICA	}	No. 1243. Injunction.
<i>vs.</i>		
THE RIO GRANDE DAM AND IRRIGATION Company et al.		

Come now the United States of America by W. B. Childers, esq., and Marsden C. Burch, esq., their United States attorneys, and come the defendants by A. B. Fall, esq., S. B. Newcomb, esq., and John Franklin, esq., their attorneys, and this cause coming on to be heard upon motion and affidavit for continuance filed herein, and the court having heard said motion and the arguments of counsel and being fully advised in the premises, doth sustain the same.

It is therefore ordered by the court that said motion be, and the same is hereby, sustained, and that the final hearing of this cause be, and the same is hereby, set for the 12th day of December, A. D. 1899, at Las Cruces, Doña Ana County, New Mexico.

And be it further remembered that afterwards, to wit, on the 2nd day of December, A. D. 1899, there was filed in the said United States district court, a stipulation, which said stipulation is in words and figures as follows, to wit:

In the district court of the third judicial district of the Territory of New Mexico,

THE UNITED STATES OF AMERICA
vs.
 THE RIO GRANDE DAM & IRRIGATION
 Company et als. } No. 1243.

Stipulation.

It is hereby stipulated and agreed, by and between Marsden C. Burch, attorney for the plaintiff, and W. A. Hawkins, S. B. Newcomb, and Albert B. Fall, attorneys for the defendants, in the above-entitled cause, that the said defendant hereby agree to waive any and all objections or exceptions that might be had or taken by them to the commissions
 10 issued out of the above court because of the fact that such commissions are directed to the United States commissioner, as officers to take the depositions of the witnesses upon the interrogatories to said commissions attached, and as named in said commissions, and residing at Laredo, Brownsville, Eagle Pass, Rio Grande City, and Galveston, Texas; and it is agreed that the said commissions may be executed and the depositions of the witnesses therein named taken by the said United States commissioners upon the direct and cross interrogatories, the same to all intents and purposes as if the said commissions had been directed to a clerk of a court of record, a notary public, or a commissioner of deeds residing at said places, in the first instance.

November 29th, 1899.

(Signed)

MARSDEN C. BURCH,

Attorney for Plaintiff.

W. A. HAWKINS,

S. B. NEWCOMB,

Per W. A. HAWKINS,

Attorneys for Defendants.

And be it further remembered that afterwards, to wit, on the 12th day of December, A. D. 1899, in the said United States district court, the following proceedings were had and entered of record, to wit:

First day, December 12th, A. D. 1899.

Be it remembered that at an adjourned term of the United States court of the third judicial district of the Territory of New Mexico, begun and held within and for said district, at the court-house in the town of Las Cruces, Doña Ana County, New Mexico, there were present:

Hon. Frank W. Parker, judge presiding; W. B. Childers, esq., United States attorney; M. C. Burch, esq., special assistant U. S. attorney; A. F. Codrington, esq., deputy U. S. marshal; James P. Mitchell, clerk.

11 THE UNITED STATES OF AMERICA,
vs.
 THE RIO GRANDE DAM & IRRIGATION
 Company et als. } No. 1243. Injunction.

Come now the United States of America by W. B. Childers, esq., and M. C. Burch, esq., their attorneys, and come the defendants by W. A. Hawkins, esq., and A. B. Fall, esq., their attorneys, and the trial of this cause is begun and testimony taken.

Now the trial of the above cause not being concluded, it is ordered by the court that it be adjourned until to-morrow morning at nine o'clock.
It is ordered by the court that court adjourn until to-morrow morning at nine o'clock.

Read and approved in open court.

(Signed)

FRANK W. PARKER, *Judge, &c.*

And be it further remembered that afterwards, to wit, on the 13th day of December, A. D. 1899, in the said United States district court, the following proceedings were had and entered of record, to wit:

Court met pursuant to adjournment; present and presiding as of yesterday.

UNITED STATES OF AMERICA,	}	No. 1243. Injunction.
<i>vs.</i>		
THE RIO GRANDE DAM AND IRRIGATION Company et al.		

Come now the parties hereto by their respective attorneys, and the trial of this cause is resumed and further testimony taken.

Now the court appoints E. L. Medler as court stenographer during the present term hereof, and he is duly sworn to well and truly serve as such.

UNITED STATES OF AMERICA,	}	No. 1243. Injunction.
<i>vs.</i>		
THE RIO GRANDE DAM AND IRRIGATION Company et al.		

12 Now the trial of this cause not being concluded, it is ordered by the court that the same be adjourned until to-morrow morning at nine o'clock.

It is ordered by the court that court adjourn until to-morrow morning at nine o'clock.

Read and approved in open court.

(Signed)

FRANK W. PARKER, *Judge, &c.*

And be it further remembered that afterwards, to-wit, on the 14th day of December, A. D. 1899, in the said United States district court, the following proceedings were had and entered of record, to wit:

Court met pursuant to adjournment; present and presiding as of yesterday.

UNITED STATES OF AMERICA,	}	No. 1243. Injunction.
<i>vs.</i>		
THE RIO GRANDE DAM AND IRRIGATION Company et al.		

Come now the parties hereto by their respective attorneys, and the trial of this cause is resumed and further testimony taken.

Now the trial of this cause not being concluded, it is ordered by the court that same be continued until to-morrow morning at nine o'clock.

It is ordered by the court that court adjourn until to-morrow morning at nine o'clock.

Read and approved in open court.

(Signed)

FRANK W. PARKER, *Judge, &c.*

And be it further remembered that afterwards, to wit, the 15th day of December, A. D. 1899, in the said United States district court, the following proceedings were had and entered of record, to wit:

Court met pursuant to adjournment; present and presiding as of yesterday.

13	UNITED STATES OF AMERICA	}	No. 1243. Injunction.
	<i>vs.</i>		
THE RIO GRANDE DAM & IRRIGATION	Company et al.		

Come now the parties hereto by their respective attorneys and the trial of this cause is resumed and further testimony taken.

	UNITED STATES OF AMERICA	}	No. 1243. Injunction.
	<i>vs.</i>		
THE RIO GRANDE DAM AND IRRIGATION	Company et al.		

Now, the trial of this cause not being concluded, it is ordered by the court that same be continued until to-morrow morning at nine o'clock.

It is ordered by the court that court adjourn until to-morrow morning at nine o'clock.

Read and approved in open court.

(Signed)

FRANK W. PARKER, *Judge, &c.*

And be it further remembered that afterwards, to wit, on the 16th day of December, A. D. 1899, in the said United States district court, the following proceedings were had and entered of record, to wit:

Court met pursuant to adjournment, present and presiding as of yesterday.

	UNITED STATES OF AMERICA	}	No. 1243. Injunction.
	<i>vs.</i>		
THE RIO GRANDE DAM AND IRRIGATION	Company et al.		

Come now the parties hereto by their respective attorneys and the trial of this cause is resumed and further testimony taken.

Now, the trial of this cause not being concluded, it is ordered by the court that same be continued until Monday morning at nine thirty o'clock.

It is ordered by the court that court adjourn until Monday morning at nine thirty o'clock.

14

Read and approved in open court.

(Signed)

FRANK W. PARKER, *Judge, &c.*

And be it further remembered that afterwards, to wit, on the 18th day of December, A. D. 1899, in the said United States district court, the following proceedings were had and entered of record, to wit:

Court met pursuant to adjournment, present and presiding as of yesterday.

UNITED STATES OF AMERICA	}	No. 1243.
<i>vs.</i>		
THE RIO GRANDE DAM & IRRIGATION Company et al.		

Come now the parties hereto by their respective attorneys and the trial of this cause is resumed and further evidence taken.

Now, the trial of this cause not being concluded, it is ordered by the court that same be continued until to-morrow morning at nine thirty o'clock.

It is ordered by the court that court adjourn until to-morrow morning at nine thirty o'clock.

Read and approved in open court.

(Signed) FRANK W. PARKER, *Judge, &c.*

And be it further remembered that afterwards, to wit, on the 19th day of December, A. D. 1899, in the said United States district court, the following proceedings were had and entered of record, to wit:

Court met pursuant to adjournment, present and presiding as of yesterday.

UNITED STATES OF AMERICA	}	No. 1243. Injunction.
<i>vs.</i>		
THE RIO GRANDE DAM AND IRRIGATION Company et al.		

15 Come now the parties hereto by their respective attorneys, and the trial of this cause is resumed, taking of evidence concluded, and argument of the case begun.

Now the trial of this cause not being concluded, it is ordered by the court that same be continued until to-morrow morning at nine o'clock.

It is ordered by the court that court adjourn until to-morrow morning at nine o'clock.

Read and approved in open court.

(Signed) FRANK W. PARKER, *Judge, &c.*

And be it further remembered that afterwards, to wit, on the 20th day of December, A. D. 1899, in the said United States district court, the following proceedings were had and entered of record, to wit:

Court met pursuant to adjournment, present and presiding as of yesterday.

UNITED STATES OF AMERICA	}	No. 1243. Injunction.
<i>vs.</i>		
THE RIO GRANDE DAM AND IRRIGATION Company et al.		

Come now the parties hereto by their respective attorneys, and the argument of this case is resumed.

Order of allowances.

UNITED STATES OF AMERICA
vs.
 THE RIO GRANDE DAM AND IRRIGATION } No. 1243. Injunction.
 Company et al.

Now the argument of this cause not being concluded, it is ordered by the court that it be continued until to-morrow morning at nine o'clock.

It is ordered by the court that court adjourn until to-morrow morning at nine o'clock.

16 Read and approved in open court.

(Signed)

FRANK W. PARKER, *Judge, &c.*

And be it further remembered that afterwards, to wit, on the 21st day of December, A. D. 1899, in the said United States district court, the following proceedings and stipulation were had, entered of record, and filed in said *in said* court, to wit:

Court met pursuant to adjournment, present and presiding as of yesterday.

UNITED STATES OF AMERICA
vs.
 THE RIO GRANDE DAM AND IRRIGATION } No. 1243. Injunction.
 Company et al.

Come now the parties hereto by their respective attorneys, and the argument of this cause is resumed.

Now the argument of this cause being concluded, the court takes the same under advisement.

It is ordered by the court that court adjourn until court in course.

Read and approved in open court.

(Signed)

FRANK W. PARKER, *Judge, &c.*

Said stipulation is in words and figures as follows, to wit:

In the district court of the Third judicial district of the Territory of New Mexico.

UNITED STATES OF AMERICA, PLAINTIFF,
vs.
 THE RIO GRANDE DAM AND IRRIGATION } No. 1243. Injunction.
 Company et al., defendants.

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Stipulation.

It is hereby stipulated and agreed in the above-entitled cause, that in the event that either party hereto should appeal or sue out a writ of error for the purpose of reviewing the decree of the district court to be rendered in this cause, such appeal shall be taken or writ of error sued out so that said cause can be docketed at the ensuing term of the supreme court of New Mexico, provided the decree in this cause is entered soon enough to enable this to be done. And the parties hereto, for the purpose of enabling said cause to be heard in the supreme court of the Territory at said

term, hereby waive all notice and citations, and agree to enter their appearance in said supreme court, and consent to ask said court to take jurisdiction of, and hear and decide said cause at said term, although said appeal may not have been taken thirty days before the first day of the ensuing term thereof, any statute or rule of the court to the contrary notwithstanding. Said parties also waive the printing of the record in said cause in said supreme court. And in the event of any appeal from the supreme court of the Territory of New Mexico to the Supreme Court of the United States shall be taken, the same shall promptly be taken and expedited with diligence.

(Signed)

W. B. CHILDERS,
U. S. Attorney, and Solicitor for Complainant.

M. C. BURCH,
Of Counsel for Complainant.

W. P. SUTTON,
Of Counsel.

ALBERT B. FALL,
Of Counsel for Defendants.

W. A. HAWKINS,
S. B. NEWCOMB.

And be it further remembered that afterwards, to wit, on the 2nd day of January, A. D. 1900, there was filed in said United States
18 district court the findings of fact by the court, which said findings of fact are in words and figures as follows, to wit:

In the district court of the third judicial district of the Territory of New Mexico,

UNITED STATES OF AMERICA, PLAINTIFF,	} No. 1243.
<i>vs.</i>	
RIO GRANDE DAM AND IRRIGATION COMPANY et al., defendants.	

Findings of fact.

From the evidence in this case, the court makes the following findings of facts:

I.

The Rio Grande is navigable only between the American points of Rio Grande City and the mouth of such river, a distance of 262 miles, measured by the sinuosities of the stream. It is navigable only between Rio Grande City and Brownsville, Texas, a distance of 177 miles by such sinuosities.

II.

That such navigation began to decline on account of scarcity of water in such river in 1888, and has continued to so decline until at the present time the same consists of occasional trips of small vessel of about

100 tons capacity. Such trips are irregular and uncertain, and so spasmodic as to time as to render such navigation of small benefit to commerce between points reached thereby.

III.

That the decline of such navigation has been occasioned by a gradual decline of the navigable capacity of such river, and the increased difficulty of navigating the same on account of scarcity of water, compelling the substitution from time to time of boats of less capacity.

IV.

The scarcity of water in said river, when it is navigable, is due largely to a drought of great severity, which has continued with only occasional interruption since about 1887, and has extended over a vast area of country several hundred miles in width and length along the general course of said river from its mouth up, and which has both affected portions of Texas and Mexico, and to the drying up of the following-named tributaries of such river, lying either in Texas or Mexico, to wit, Elm Creek, Los Moras, Piedras Pintas, Sycamore, San Felipe, Escondido, San Diego, Las Bacas, Trientauno, Santa Carlo, Cienegas, and Salado, all referred to in the report of Major Emory, as well as described by the witnesses in this case, and all of which were from ten to eighteen years ago bold, running streams.

V.

There is no evidence from which the court can estimate the extent of the diminution of such rainfall, or from which it can determine that there has been any permanent change in the amount of rainfall in said region, or the amount of such effect of such diminution in rainfall and drying up of streams has had upon the navigable capacity of said river since the commencement of this suit in May, 1897.

VI.

At the measuring station at San Marcial, forty miles above Elephant Butte, the Rio Grande is shown from evidence and measurements filed in this case to be largely a torrential stream, varying from dry bed to floods of considerable size and duration, and this torrential flow characterizes its entire course through New Mexico.

VII.

In its course, both in Colorado and New Mexico, a large percentage of its waters are constantly lost by causes not accurately determined, but generally clas'ed as seepage and evaporation, and between San Marcial, New Mexico, and El Paso, Texas, a distance of 300 miles measured by the sinuosities of the river, it is shown that the percentage of loss from such causes is about one-third of the entire volum' of such water, and at various other points in New Mexico such losses, more or less equal in percentage, are also shown to occur.

While there are no measurements from which the percentage of loss by evaporation from the volum' of water after the same passes El Paso, Texas, can be definitely determined, yet the general character of the bed, banks, formation, and soil is shown to be the same general character as that portion of such stream lying between San Marcial and El Paso, where such large losses in volum' have been accurately determined, and that for a distance of 400 miles below El Paso, Texas, measured by the sinuosities of the river to Presidio del Norte, such seepage and evaporation continues to diminish the volum' of such water.

IX.

Between Elephant Butte, the point where defendants propose to divert the waters of such stream, and Presidio del Norte, a distance of 640 miles by the sinuosities of the stream, there are no living tributaries to said Rio Grande, and the waters of such stream are not reinforced substantially between such points by any regular flow or tributary, and there is no peren'ial flow of the Rio Grande at Presidio del Norte.

X.

The first peren'ial tributary of the Rio Grande below Elephant Butte is the Conchos, which comes into the Rio Grande at Presidio del Norte. The Conchos is a peren'ial stream rising in the mountains of northern Mexico, and flowing several hundred miles northerly into the Rio Grande. In season it is a torrential stream of great magnitud', and at all times carries a considerable quantity of water. A cross section of the Rio Grande, near and just below where the Conchos joins it, shows an area at least twenty-five times as great as the area of a cross section of the Rio Grande just above the mouth of the Concho, measured to the highest water mark known, so far as disclosed by the evidence, in thirty-three years, the carrying capacity of the lower cross section being variously estimated at from sixteen to twenty-five times as great as the upper cross section.

XI.

It has only been shown by the evidence that the waters in the Rio Grande bed passed Presidio del Norte, the mouth of the Conchos, in considerable quantities upon one occasion—that is, during the month of May, 1897—but it is fairly inferable from the testimony that such waters have so passed such point on other occasions in such quantities. No evidence has been offered as to the amount then so passing the mouth of the Conchos, in the Rio Grande bed, except that of one witness to the effect that the height of the same, over a ford some distance below the mouth of the Conchos (the dimensions of the river at that point not being shown), was increased about three feet, and the duration of its passage at such height was for about eight or ten days, and except some estimates, based upon the surface area of the cross section referred to, showing the flow to be 3,250 cubic feet per second. And I find that the evidence fails to show that at the period mentioned the waters so flowing by the mouth of the Conchos affected the height of the river at Laredo, Texas, to any considerable extent.

XII.

It appears from the evidence that the Rio Grande was navigated in a common rowboat drawing about six inches of water, during the winter season of 1893-1894, from El Paso, Texas, to the mouth of the Conchos, a distance estimated at 400 miles by the sinuosities of the stream, at a stage of water from 3 to 3½ feet deep at El Paso, Texas, at the time of starting, said trip occupying twenty-one days, and without finding any obstruction in said stream except scarcity of water for the last forty miles above the mouth of the Conchos. That after remaining a period of eighteen days in the vicinity of Presidio del Norte, the party making said trip embarked upon water said to have been furnished from the Rio Conchos, and continued to Del Rio, Texas, a distance of 562 miles by the sinuosities of the stream.

XIII.

There is no evidence in the case tending to show that there is any obstruction to the free and uninterrupted flow of the Rio Grande
22 from Del Rio, Texas, to Rio Grande City, Texas.

XIV.

There is no evidence in the case tending to show that water which has reached Del Rio, Texas, would not uninterruptedly continue to flow to Rio Grande City, Texas, except such portions thereof as may be lost by seepage or evaporation.

XV.

The Conchos River enters the Rio Grande from the Mexican side at nearly right angles. On the lower or southerly side of the conchos there is elevated ground, upon which is situated the village of Presidio del Norte. On the upper or northerly side of the Conchos, and on the westerly or Mexican bank of the Rio Grande, the land is low and subject to much overflow. On the American side of the Rio Grande, at the mouth of the Conchos, the banks are high and not subject to overflow.

XVI.

The distance by the sinuosities of the river between Presidio del Norte and Rio Grande City is something over 900 miles, and the bed of the stream between such points appears to be practically a succession of basins or valleys of greater or less extent, and of the same character, and affording the same facilities for absorbing the water as the valleys above El Paso, or those above the mouth of the Conchos, and I find that large amounts of water flowing between the Conchos and Rio Grande City are lost between said points by evaporation and seepage.

XVII.

The character of the formation in the basins or valleys of the Rio Grande, at the only point where the same has been sounded to any great depth—that is, by the Boundary Commission at El Paso, Texas—show

the depth of sand and gravel to be at least sixty feet, and I can see no reason why the other valleys and basins along the course of the Rio Grande should not show the same formation to at least the same depth, the surface indications and appearance being substantially the same throughout its length.

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XVIII.

The water shed of the Rio Grande and its tributaries above Elephant Butte is approximately 25,000 square miles in extent. The water shed between Elephant Butte and El Paso is approximately 5,700 square miles. The water shed from Elephant Butte to Rio Grande City, of the Rio Grande and its tributaries, after deducting the area of such basins as may not find an outlet into the stream, is approximately 170,000 square miles. The source of supply of the waters flowing past Rio Grande City at the head of navigation is largely this comparatively enormous water shed of 8170,000 square miles below Elephant Butte, feeding with tropical rains the Conchos and San Juan particularly, rising far south in the mountains of Mexico and flowing north into the Rio Grande, and also affording a supply for the Pecos, Devils River, the Good Enough, and other perennial streams, as well as the decreased but still flowing waters of the San Felipe and Salado, and at times filling with floods the now dry beds of the former perennial streams heretofore referred to, as well as many smaller streams not named.

XIX.

Records have been kept of the flow of the water passing El Paso, Texas, for the part of the year 1889, and for the years 1890, 1891, 1892, part of 1893, 1897, 1898, and part of 1899. No records were kept for any other years. These records so kept show the amount of water passing El Paso for said years, respectively, to be as follows, viz:

From May 1st to Dec. 31st, 1889	370,000 acre feet
1890	971,000 " "
1891	1,943,000 " "
1892	941,000 " "
Jan. 1st to July 1st, 1893.....	329,000 " "
1897	1,369,000 " "
1898	689,000 " "
From Jan. 1st to Sept. 30, 1899	70,000 " "

The river after having been dry, commenced to run about December 10, 1899.

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XX.

The evidence shows that certain cross-sections were taken by a member of the International (Water) Boundary Commission, at a certain point one mile below Rio Grande City, Texas, which indicates the amount of water required to raise the river at that point, as appears from the following table:

Estimated flow of the Rio Grande one mile below Rio Grande City, Texas. Conditions assumed: River at low water; sudden rise comes, rising 1 ft. in 4 hours at first, and going up the high water.

Stage of river.	Cross sect., sq. ft.	Fall.	Current.	Flow, sec. ft.	Add : for possible scour.	Max. flow, sec. ft.	Added water for rise.	
Low water.....	1,226	1.7000	1.63 ft. sec...	1,998	.....	1,998	343 s. f. ...	1,655 s. f. at low water.
1 ft. rise.....	1,591	1.6950	1.90 " " "	3,023	16 " " "	3,053	1,398 " "	" "
2 " " " " " "	1,971	1.6900	2.14 " " "	4,218	32 " " "	4,302	2,647 " "	" "
3 " " " " " "	2,363	1.6850	2.40 " " "	5,474	48 " " "	5,841	4,186 " "	" "
4 " " " " " "	2,765	1.6800	2.64 " " "	6,800	64 " " "	7,592	5,937 " "	" "
5 " " " " " "	3,167	1.6750	2.88 " " "	8,121	80 " " "	9,597	7,922 " "	" "
6 " " " " " "	3,594	1.6700	3.12 " " "	9,413	96 " " "	11,886	10,231 " "	" "
7 " " " " " "	4,018	1.6650	3.36 " " "	10,687	112 " " "	13,380	12,651 " "	" "
8 " " " " " "	4,418	1.6600	3.60 " " "	11,957	128 " " "	14,919	15,254 " "	" "
9 " " " " " "	4,834	1.6550	3.84 " " "	13,214	144 " " "	16,909	18,198 " "	" "
10 " " " " " "	5,324	1.6500	4.08 " " "	14,467	160 " " "	19,853	21,392 " "	" "
11 " " " " " "	5,779	1.6450	4.32 " " "	15,714	176 " " "	22,957	24,368 " "	" "
12 " " " " " "	6,222	1.6400	4.56 " " "	16,957	192 " " "	26,023	27,364 " "	" "
13 " " " " " "	6,678	1.6350	4.80 " " "	18,195	208 " " "	29,019	30,593 " "	" "
14 " " " " " "	7,139	1.6300	5.04 " " "	19,428	224 " " "	32,248	33,919 " "	" "
15 " " " " " "	7,604	1.6250	5.28 " " "	20,657	240 " " "	35,574	37,323 " "	" "
16.1 " " " " " "	8,123	1.6200	5.52 " " "	21,882	256 " " "	38,978	40,811 " "	" "
16.1 " " " " " "	8,123	1.6200	4.80 " " "	38,980	" " " "	42,889	44,234 " "	" "
After passing 11 ft. this does not show all of flood flow, as water would begin at this height to leave river above cross-section.								
Flow at low water, no rise.	1,226	1.10000	1.35 ft. sec. ...	1,655				
Flow Dec. 1897, 21 ft. up.	2,089	1.10000	1.84 " " "	3,697				

XXI.

The evidence shows that a cross-section was also taken twenty-one miles (by river) above Brownsville, Texas, and shows the capacity of the river at said point to be as follows:

Estimated flow of Rio Grande 21 miles (by river) above Brownsville, Texas. Conditions assumed: River at low water; sudden rise comes, rising 1 ft. in 4 hours at first, and going up to high water.

Stage of river.	Cross sect., sq. ft.	Fall.	Current.	Flow, sec. ft.	Add : for possible scour.	Max. flow, sec. ft.	Added water for rise.	
Low water.....	1,198	1.6300	1.60 ft. sec. ...	1,917	.....	1,917	336 s. f. ...	1,581 s. f. at low water.
1 ft. rise.....	1,588	1.6200	1.92 " " "	3,045	1 " " "	3,079	1,198 " "	" "
2 " " " " " "	1,989	1.6100	2.24 " " "	4,165	2 " " "	4,544	2,963 " "	" "
3 " " " " " "	2,386	1.6000	2.56 " " "	5,110	3 " " "	5,554	4,773 " "	" "
4 " " " " " "	2,808	1.5900	2.88 " " "	6,075	4 " " "	6,553	6,792 " "	" "
5 " " " " " "	3,223	1.5800	3.11 " " "	7,023	5 " " "	7,524	8,143 " "	" "
6 " " " " " "	3,641	1.5700	3.37 " " "	7,970	6 " " "	8,492	9,671 " "	" "
7 " " " " " "	4,062	1.5600	3.60 " " "	8,913	7 " " "	9,489	11,161 " "	" "
8 " " " " " "	4,485	1.5500	3.82 " " "	9,857	8 " " "	10,392	12,651 " "	" "
9 " " " " " "	4,913	1.5400	4.03 " " "	10,800	9 " " "	11,399	14,138 " "	" "
10 " " " " " "	5,344	1.5300	4.27 " " "	11,743	10 " " "	12,406	15,625 " "	" "
11 " " " " " "	5,777	1.5200	4.48 " " "	12,686	11 " " "	13,413	17,112 " "	" "
12.1 " " " " " "	6,257	1.5100	4.72 " " "	13,629	12 " " "	14,420	18,600 " "	" "
After passing 8 ft. or 9 ft. this does not show all of flood flow, as water would begin at this height to leave river channel above cross section.								
Flow at low water, no rise.	1,198	1.60000	1.32 ft. sec. ...	1,581				
Flow, March 21, 1898, 1.5 ft. up.	1,700	1.60000	1.66 " " "	2,822				

XXII.

The testimony in the case shows the following table of distances, viz:

Distances from Rio Grande, scaled from map.

From—	To—	Distance by channel.	Distance along axis.
Headwaters	Del Norte		80 miles.
Del Norte	Colorado State Line	65 "	
State line	Embudo	65 "	
Embudo	White Rock Cañon	30 "	
White Rock Cañon	(Length)	15 "	
White Rock Cañon	Albuquerque	30 "	
Albuquerque	San Marcial	105 "	
San Marcial	Elephant Butte	40 "	
Elephant Butte	Fort Seldon	65 "	
Fort Seldon	El Paso	80 "	
El Paso	Lower end El Paso Valley	125 "	
Lower End Valley	Mouth of Conchos River	250 "	
Mouth of the Conchos	Mouth of Pecos	35 "	
Mouth of Pecos	Mouth of Devil's River	65 "	
Mouth of Devil's River	Eagle Pass	110 "	
Eagle Pass	Laredo	70 miles.	
Laredo	Mouth Salado River	50 "	
Mouth Salado	Mouth Alamo	8 "	
Alamo	Roma	12 "	
Roma	Mouth San Juan	14 "	
Mouth San Juan	Rio Grande City	17 "	
Rio Grande City	Brownsville	85 "	
Brownsville	Mouth Rio Grande		30 "

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XXIII.

The proposed dam and reservoir of the defendants would contain 11,036,722,000 cubic feet of water, or 253,370 acre-feet of water.

XXIV.

The defendants propose to irrigate 230,000 acres of valley and 300,000 acres of mesa lands, in all 530,000 acres. In accordance with the amount of water used in Colorado and New Mexico, for irrigating land it will require 954,000 acre-feet of water to irrigate that quantity of land proposed to be irrigated by defendants, or from three to four times the capacity of said reservoir.

XXV.

The testimony shows the following to be the time it would have taken all the flow of the Rio Grande to have filled the Elephant Butte reservoir, supposing it to hold 253,000 acre-feet, during the maximum flow in each year, from El Paso gauging station, viz:

1889, all of May flow, and 8 or 10 days of June flow	40 days.
1890, from May 15th to June 3rd	19 "
1891, from May 12th to May 20th	9 "
1892, from May 2nd to May 17th	16 "
1893, from April 25th to May 31st	37 "
1897, from May 24th to June 3rd	11 "
1898, two floods, April 22nd to May 8th, and July 17th to July 25th	26 "
1899, no flood. Total flow for year only 70,000 acre-feet at El Paso.	

XXVI.

The testimony shows the time necessary each year to fill the proposed Elephant Butte reservoir of the defendants, supposing it hold 253,000 acre-feet, and starting at the beginning of spring flood and allowing enough water to pass proposed dam to supply all ditches below it (assuming this amount to be 500 second-feet for the El Paso Valley), would be as follows, viz:

27	1889. From record of El Paso gauging station, all surplus flow above 500 second-feet from May 1st to June 15th	46 days
	1890. Same condition from April 17th to May 19th	33 "
	1891. Same condition from April 12th to May 3rd	22 "
	1892. Same condition from April 15th to May 7th	23 "
	1893. All surplus flow above 500 second-feet at El Paso gauging station for irrigation season would lack 11,000 acre-feet of filling reservoir.	
	1897. From record of El Paso gauging station, all surplus flow above 500 second-feet from April 13th to May 11th ...	29 "
	1898. Same conditions from April 17th to June 20th	65 "
	1899. During whole season only 6,500 acre-feet passed El Paso gauging station above the 500 second-feet.	

XXVII.

That the evidence shows that cross sections of the Rio Grande were taken by a member of the boundary commission to the extent of three or four per mile for the entire distance from Rio Grande City to Brownsville, Texas, and that the two cross sections hereinbefore referred to were a fair indication of the contour of the Rio Grande between those points.

XXVIII.

In attempting to arrive at a conclusion in this case I have made some computations, based partially upon known data and partially upon probabilities arising from the evidence. In such computation I have assumed the following conditions:

1. It appears by comparison of the tables of measurements at the gauging stations of San Marcial and El Paso that there is no material flattening or tailing out of the floods in the Rio Grande. If this remains true throughout the entire course of the river, a body of water passing El Paso would reach Rio Grande City, if at all, in practically the same form as to length and height as at El Paso, less losses between those points.

2. It seems probable from the conditions of the bed and banks of the stream and the climate of the country through which it passes that any flow of less than 2,000 second-feet at El Paso or 3,000 second-feet at San Marcial can not possibly have any effect on the river at the head of navigation. It also seems probable that only such flows as are above this amount and are sustained for a considerable period could reach the head of navigation in substantial quantities.

3. It seems probable that loss by seepage and evaporation will be as great between El Paso and Presidio del Norte as between San Marcial and El Paso; the loss may be greater, owing to greater distance.

4. From Presidio to Rio Grande City flood waters from El Paso would encounter in the bed the perennial waters known to exist there. To what extent they furnished a water table for these flood waters to travel upon is unknown, but I have assumed in this computation that losses by seepage and evaporation are thereby lessened, and have taken an arbitrary twenty per cent as representing the probable loss from such causes.

5. It seems probable that a flood passing El Paso would reach Rio Grande City, if at all, in from fifteen to twenty-five days, assuming the river to have comparatively a uniform fall between those points.

6. It appears from the evidence that a rise of two feet above low water between Rio Grande City and Brownsville is necessary to make navigation practicable, and these waters usually flowing down to that point, if at all, at a season when other supplies are low, I assume a rise of 2 ft. to be necessary to be of any substantial benefit to navigation.

Assuming these conditions, I have prepared the following table:

Year.	Duration of flood over 2,000 sec. ft. days (at El Paso).	Acres-feet passing El Paso during time of flood.	Acres-feet passing Presidio del Norte, supposing 33 1/3 per cent lost.	If 20 per cent is lost between Presidio and Rio Grande City, this would raise river at Rio Grande City the following amounts above low water for time flood was passing El Paso.	If 45 per cent is lost between El Paso & Presidio del Norte and 20 per cent between Presidio & Rio Grande City, this would raise river at Rio Grande City the following amounts above low water for time flood was passing El Paso.
1890.....	April 7 to July 3, 76 days.	733,570	489,030	2.0 ft. for 75 days ...	1.6 ft. for 75 days.
1891.....	April 12 to July 14, 94 days.	1,464,210	976,140	3.0 ft. for 94 days ...	2.5 ft. for 94 days.
1892.....	April 15 to June 21, 68 days.	770,300	513,600	2.2 ft. for 68 days ...	1.9 ft. for 68 days.
1893.....	April 29 to May 29, 31 days.	239,500	159,700	1.5 ft. for 32 days ...	1.3 ft. for 32 days.
1894.....	No record, but was as dry as 1893, and possibly drier.				
San Marcial, 1895.	April 12 to June 30, 72 days.	634,700 at San Marcial, 33 1/3 off \$53,100 at El Paso.	282,100	1.2 ft. for 72 days ...	0.9 ft. for 72 days.
San Marcial, 1896.	April 13 to May 14, 31 days.	236,200 at San Marcial, 33 1/3 off 157,500 at El Paso.	105,000	1.0 ft. for 30 days ...	0.8 ft. for 30 days.
1897.....	April 21 to July 4, 75 days.	983,200	655,500	2.0 ft. for 75 days ...	2.1 ft. for 75 days.
1898.....	April 20 to May 15, 24 days.	186,400	124,100	1.5 ft. for 24 days ...	1.3 ft. for 24 days.
1899.....	No flood.				

30 Assuming the loss from seepage and evaporation between El Paso and Presidio del Norte to be forty-five per cent instead of thirty-three and a third (which would be at the same rate of loss per mile as is shown to occur between San Marcial and El Paso), the result, assuming all other conditions to be as hereinbefore stated, would be as shown in the last column of the foregoing table.

It will be observed that the above results show a contribution from floods passing El Paso to the navigable capacity at Rio Grande City to

the extent of a rise of two feet during four of the ten years mentioned, when 33 $\frac{1}{4}$ per cent is deducted for loss between El Paso and Presidio, and during three years out of the ten years, counting 1892, when 45 per cent is deducted between the same points. Is to be further observed that no account is taken in above computations for variations in the height of floods at El Paso, but the results simply show the average height a given amount of water passing El Paso, less deductions for probable loss, would raise the river at Rio Grande City for the same number of days it was passing El Paso. If these variations continue from El Paso to Rio Grande City the beneficial effect on navigability would be lessened, owing to corresponding irregularity in the height of the raise at the latter point.

How reliable such results may be can not be determined from the evidence. Whether the loss is less or greater between the points named is unknown. There is some evidence in the case tending to disprove the correctness of such results, for example, the testimony of Daly to the effect that 1897 flood only lasted eight or ten days at Presidio del Norte, and the testimony of Turpin that the same flood made no appreciable change in the river at Laredo, and the affidavit of Kelly to the effect that they have had no floods from the upper Rio Grande in recent years. On the whole, I am unable to say to how much credit the result of such computations are entitled in arriving at the ultimate fact in question in this case.

31

XXIX.

There is no direct testimony in this case showing that any given quantity of water in the Rio Grande passing El Paso reaches Rio Grande City, the head of navigation, and *there* accomplishes any certain effect upon the navigability of the stream.

XXX.

That the waters of the Rio Grande passing El Paso occasionally in seasons of high and protracted floods reach Rio Grande City, the head of navigation, in considerable quantities seems probable, but that they reach that point in quantities sufficient and in such form as to substantially add to the navigable capacity of the stream is not satisfactorily established by the evidence, nor can such a conclusion be satisfactorily deduced therefrom. I therefore find that the intended acts of the defendants in the construction of a dam or dams, or reservoirs, and in appropriating the waters of the Rio Grande, will not substantially diminish the navigability of that stream within the limits of the present navigability.

Let a decree be prepared and entered dismissing the bill of complaint herein.

(Signed)

FRANK W. PARKER, *Judge, &c.*

ALBUQUERQUE, N. M., Jan. 1, 1900.

And be it further remembered that afterwards, to wit, on the 3rd day of January, A. D. 1900, there was filed in said United States district

court, a motion for rehearing and also affidavits in support of said motion, which said motion is in words and figures as follows, to wit:

In the district court of the third judicial district of the Territory of
New Mexico.

UNITED STATES OF AMERICA, PLAINTIFF,	} No. 1243.
<i>vs.</i>	
RIO GRANDE DAM AND IRRIGATION COMPANY	
et al., defendants.	

32

Motion for rehearing.

Now comes the plaintiff in the above-entitled cause, by W. B. Childers, United States attorney for the Territory of New Mexico, M. C. Burch and W. P. Sutton, special assistant United States attorneys, and files this its motion and petition for rehearing, and for grounds of said motion alleges the following:

I.

Because the said plaintiff, since the trial of said cause, has discovered new evidence, which evidence could not by any reasonable diligence on the part of the said plaintiff, have been discovered and procured for use on the former trial of this cause.

Said evidence consists of the facts set up and alleged in the affidavit of Frank P. Clark, dated January 2nd, 1900, hereto attached and made a part of this motion. From an inspection of the said affidavit, it will appear that the facts therein stated and which will be testified to by the said Clark on said rehearing of said cause, and that the said plaintiff can procure and will procure the depositions of Doctor J. B. Grady, who resides at Eastport, Maine, and also the deposition of William Kelly, whose whereabouts is unknown to the plaintiff, but which can be ascertained and his deposition procured for use on said trial.

II.

An inspection of said affidavit will show that the Rio Grande was navigated by the said Clark and his companions in the year 1881, from El Paso to Presidio del Norte in a boat very much larger than the one testified to have been used on a similar journey by the witness Jas. H. McMahan, and the evidence of said witnesses will show that the Rio Grande was very much larger than the Rio Concho, and carried such a volume of water as to show conclusively that said river has largely contributed to the navigability of the stream below Rio Grande City, Texas.

III.

An inspection of said affidavit will show that said evidence will establish the fact that the bed and channel of the Rio Grande above the mouth of the Concho was very much larger than the bed and channel of the Concho at its mouth, and that neither the Concho

or any other tributary above its mouth was at that time contributing any considerable amount of water to the volume of the water then in the Rio Grande.

IV.

That said evidence shows or tends to show that there was no perceptible loss, either by seepage or any other cause, in the waters of the Rio Grande from El Paso to the mouth of the Concho, and that on the contrary said Rio Grande maintained its volume of water unimpaired and apparently fully equal at the mouth of the Concho to what it was when the said parties set out from El Paso; thus tending to disprove the allegations of loss by seepage in said Rio Grande between El Paso and the mouth of the Concho.

V.

The plaintiff, as a further ground for said rehearing, alleges that since the rendition of the opinion by the Supreme Court of the United States in this cause, remanding the same for a new trial, there have been no spring floods in the Rio Grande which could have been measured; that the plaintiff was compelled to proceed to trial without any opportunity to have such measurements made, and that if a rehearing is granted in this case the plaintiff will cause gauge stations to be established at a point in the Rio Grande some ten miles above the mouth of the Concho; in the Rio Concho some five miles above its debouchere; in the Rio Grande some two miles below the junction of the Concho with the Rio Grande; and also one in the Rio Grande just above the mouth of the Pecos; one in the Pecos some distance above its mouth; one in Devil's River, some distance above its mouth; one in the Rio Grande just below the debouchere of Devil's River, and others at Eagle Pass, Laredo, and Rio Grande City, Texas. And that cross sections will be made of the bed of the Rio Grande at some twenty or more places between El Paso and just below the mouth of the Rio Concho, and in the Rio Grande near the mouth of the Pecos, and at Eagle Pass and Laredo, and such other points as the court may indicate. That at such gauge stations plaintiff will locate observers who shall make accurate measurements of the volume and flood and capacity of the said streams, with a view of identifying any and all rises of water which during the coming spring floods shall pass El Paso, Texas; to show their amount, volume, and flow at the various points named in the river below that point, and eventually the amount which they or each of them contribute to the navigable capacity of the river at Rio Grande City, Texas. And that said measurements and the reports of such observers, together with the cross sections previously mentioned, shall be supervised or done under the direction of W. W. Follett, the civil engineer connected with the United States and Mexican Boundary (Water) Commission, and by him produced and identified at the time of said rehearing.

VI.

As a condition for the granting of said rehearing the plaintiff consents to enter into a stipulation with the defendants that said cause may be

reheard in the month of July or August, and if an appeal is desired by either party to the supreme court of the Territory, that the same may be heard in said supreme court at such adjourned term of the court as may be fixed by the court, and if any appeal from the decision of the court is desired by either party, that the same shall at once be taken so that it will be returnable to the ensuing October term of the Supreme Court of the United States.

VII.

In support of this motion, and to show the diligence on the part of the plaintiff, plaintiff files herewith the affidavit of W. P. Sutton, one of its attorneys who was engaged in the preparation of said cause for trial, and will file and use, as soon as the same can be procured, the affidavit of M. C. Burch, one of plaintiff's attorneys, who was engaged in the preparation of said cause for trial, the plaintiff being unable to file the same at this time on account of the fact that the said Burch is in the city of Washington, District of Columbia.

VIII.

35 The plaintiff further offers and consents to use the testimony already taken in a new trial or rehearing of this cause.

Wherefore, plaintiff prays the court to set aside the findings made, and decree, if the same has already been entered in this case, and grant the rehearing prayed for.

(Signed)

W. B. CHILDERS,
United States Attorney.
M. C. BURCH,
W. P. SUTTON,
Of Counsel.

And said affidavits are in words and figures as follows, to wit:

In the district court of the United States for the third judicial district of the Territory of New Mexico, sitting for the trial of causes arising under the Constitution and laws of the United States.

THE UNITED STATES, PLAINTIFF,	} Injunction No. 1243.
<i>vs.</i>	
THE RIO GRANDE DAM AND IRRIGATION Company et als., defendants.	

Affidavit to support motion for new trial.

WESTERN DISTRICT OF TEXAS,
County of Texas, ss:

FRANK P. CLARK, having been duly sworn, deposes and says, that he resides in the city of El Paso, in said county and district, and has resided since 1877, except that for the years 1892 to 1895 he resided in Tularosa, New Mexico; that he is special deputy collector of customs for the United States for the district of Paso del Norte, port of El Paso, Texas, and that his age is 47 years.

Affiant further states that, in the spring of 1881, he, together with Dr. James B. Grady, James Tayes, and William Kelly, all then residing in El Paso, Texas, agreed among themselves upon a trip along the lower waters of the river Concho, in the State of Chihuahua, in the Republic of Mexico, in search of gold; that, in pursuance of this agreement, he and the others named above cause' to be constructed in the city of El Paso, Texas, in the month of April, 1881, a large row-boat made of California redwood, some twenty (20) feet long and some six (6) feet wide, in which they proposed to navigate the Rio Grande from said city of El Paso down to or below the mouth of said Concho River. Said boat was of the dimensions aforesaid, was propelled by oars, two on each side, and steered by a rudder. It was entirely covered by an awning securely held by posts and carried at the front an American and at the stern a Mexican flag.

That the said boat so constructed and equipped carried also a supply of provisions and other things deemed necessary for the enterprise.

That, during the month of April, 1881, the Rio Grande had been flowing a steady stream, not at very high flood, but in such a volume as to induce them to think that they could successfully navigate down to said Concho, and that on May 5, 1881 (the Cinco de Mayo of Mexico), the said Clark, and the said Grady, Kelly, and Tayes, each and all embarked in said boat at or near the ferry crossing on said Rio Grande between said city of El Paso and the city of Paso del Norte, Mexico (now Ciudad Juarez), about the hour of twelve o'clock on said day, and in the presence of a large number of friends and spectators, for their journey down said Rio Grande.

That the Rio Grande was not then at high flood stage, but was flowing a good volume of water ample for their purpose. That the current was swift, the river confined within its banks for nearly the entire distance, the most noted exceptions being occasional overflows of a mile or so in width in the El Paso Valley, immediately below El Paso, Texas; that, in much of the way, the walls of the stream were of rock and quite high, often more than one hundred feet, with, all its course, a very swift current; that said Clark and his companions made very quick time, jumping several falls of three to six feet safely in their boat, and in two instances taking said boat out and skidding it around to avoid ugly protruding rocks in the bed of the stream. That the flow or volume of this stream kept up mightily, in fact seemed to increase, although they had no rains en route, nor did any streams discharge into said river so far as said Clark recalls; that at the close of the fifth day, or, say, on May 9, 1881, the said party passed the mouth of the Concho River and stopped on the American side at the town called Presidio del Norte, opposite the Mexican town of Ojinaga, in the State of Chihuahua, in the Republic of Mexico.

That the boat came the whole journey safely, having at all times on the way an ample supply of water, and that in the last stages the volume of water in the stream appeared to be really larger and deeper than when they left El Paso, Texas.

That they passed the mouth of the Concho on the fifth and last day of their river trip, and that in comparison with the Rio Grande said Concho was a mere creek, and that the waters of the Rio Grande set back up into the mouth of said Concho for some little distance, and the said Concho

was flowing a clear stream not to exceed apparently one foot in depth, and not to exceed one-fourth of the width of the regular channel stream of the Rio Grande at that place and time.

That, on their course down the Rio Grande there were no side valleys or lowlands of any appreciable extent, except in the El Paso Valley above mentioned, and that the waters of the said stream were not lost or dissipated by the way, but flowed fully and apparently integrally, reaching and passing the mouth of the Concho in full flow and volume.

That said Clark and the others of his party stopped at the said town of Presidio del Norte, at the house of one Richard Daly, for five days; that there they outfitted with a team, wagon, and other articles, and there also sold their said boat to said Daly for, as affiant recollects, seventy-five (\$75.00) dollars, and then set out, about May 15, 1881, in wagon, to pass up the course of the said Concho in search of gold.

That on the said wagon journey they several times forded the river Concho, and in no place was it a considerable stream, but narrow and shallow. Affiant further states that during the five days which he remained at Daly's he was in constant sight of the Rio Grande and had personal knowledge that it maintained its volume and flowed continuously on towards the mouth; and that from all the facts in his knowledge this volume of water flowing in said Rio Grande was not, during that time, appreciably increased by the waters of the Concho, but that the said Rio Grande was fed and maintained wholly by waters passing at El Paso, Texas, similar to those on which they embarked.

That said Clark and the others of his party continued on their wagon journey until they arrived at the city of Chihuahua, and thence returned to El Paso, Texas, where they arrived on or about June 5, 1881.

Affiant declares that to the best of his belief Dr. J. B. Grady now resides at Eastport, Maine, and that he will fully corroborate all the within statements. That, as to William Kelly, he is not aware of his present address, but knows a relative of Kelly's through whom he thinks said Kelly's address can be obtained, and that he, too, will fully confirm all the statements herein; and that as to James Tayes, he verily believes him to have died several years since in California.

Affiant further declares that he has no interest of any part in this matter except to tell the facts for such use as they may serve.

(Signed)

F. P. CLARK.

Sworn to and subscribed before me this 2nd day of January, A. D. 1900.

(Signed)

[SEAL.]

Notary Public, El Paso Co., Tex.

In the district court of the United States for the third district of the Territory of New Mexico, sitting for the trial of causes arising under the Constitution and laws of the United States.

THE UNITED STATES, PLAINTIFF,

vs.

RIO GRANDE DAM AND IRRIGATION COMPANY
et als., defendants.

39 FRANK P. CLARK, being first duly sworn, upon his oath says that he is the identical person who has heretofore made an affidavit to be used in the above-entitled cause, and which has been filed

in support of a motion for a rehearing thereof, and affiant further says that the facts which are stated in said affidavit so used were recited and told by him to Warner P. Sutton, special counsel in said cause, either on or before the 25th day of December, 1899, and within a short time after the close of the trial of said cause at Las Cruces, New Mexico; that at the time affiant told said Sutton thereof, he, the said Sutton, stated that he might want to use said facts in the shape of an affidavit, and asked the affiant if he would make affidavit thereto, to which the affiant assented.

F. P. CLARK.

(Signed)

Sworn and subscribed to before me this 4th day of January, A. D. 1900.

D. H. HART,
Clerk U. S. District Court,
By J. P. HUDGSON, Deputy.

In the district court of the United States for the third judicial district of the Territory of New Mexico.

THE UNITED STATES	}	No. 1243.
vs.		
THE RIO GRANDE DAM AND IRRIGATION Company et als.		

Affidavit in support of motion for retrial.

UNITED STATES OF AMERICA,
The District of Columbia, ss:

MARSDEN C. BURCH, having been first duly sworn, deposes and says that he is one of the counsel in the above-entitled cause; that he has been in charge of same by orders of the Attorney-General of the United States practically since it was ordered to be remanded to this court by the Supreme Court of the United States; that he has since some time in

40 June worked incessantly in acquainting himself with the facts in said cause as heretofore set forth in his affidavit in support of a motion for a continuance of this cause, now a part of the files in this cause and heard by this honorable court, when such continuance was granted at Las Cruces, New Mexico, to which affidavit as to this affiant's diligence up to the time of making such motion he respectfully refers.

Affiant further says that after such continuance was granted by this court as aforesaid there were forty-two days left in which to prepare for trial; that he immediately started for Washington from Las Cruces, New Mexico, as was necessary, and en route telegraphed from La Junta, Colorado, for W. P. Sutton, who had previously been employed for the purpose, to report at once to Washington for duty; that he himself prepared as speedily as possible to return to the vicinity of Las Cruces, and, having arranged for said Sutton to go in advance, which he did, this deponent left Washington on the 8th day of November, and by continuous traveling reached El Paso on Sunday, the 12th day of November; that from said 12th day of November until the 12th day of December, when the trial of this cause began, affiant was constantly busy making every preparation within his power to carry out the mandate of the Supreme Court

of the United States in the then approaching trial. Affiant says that he made inquiry in every direction that he knew, of every such person as he was able to find, who was acquainted with the Rio Grande River between El Paso, Texas, and the mouth thereof below Brownsville; that he repeatedly talked with W. W. Follett, the engineer of the International Boundary Commission, a man whom he believed would know as much of the course of said river as anyone, and that he expressly stated to affiant that he knew of no one living who had been through that portion of the river from El Paso down to the mouth of the Pecos River; that the matter was a subject of frequent expressions of regret upon the part of this affiant, as well as said Follett, that no proof or testimony concerning the condition of said river, including its beds, could be found; that on one occasion Mr. W. S. Hawkins, of counsel for the defendant herein, came to Mr. Follett's office in El Paso when affiant was present, and in the course of a triangular conversation between affiant and said Hawkins

41 and Follett, said Hawkins also regretted that no testimony concerning the said stream, or that portion of the same above mentioned, could be had for the purpose of the trial of this cause, to which suggestion both Follett and affiant assented; that said Hawkins then brought up the subject of one Hill, a Geological Survey official of the United States, who was reputed to be engaged in making geological researches at some point which affiant understood to be in the lower part of the unknown portion of said stream. Said Hawkins then and there expressed a regret that a report could not be secured from said Hill for the purpose of the trial of this cause. Being unknown to that region personally, and not supposing that exigencies of the case demanded an attempt to find said Hill, and understanding from the conversation that said Hill was not directly engaged in any inquiry which would bear upon the supposed facts in this case, and that it was impracticable to reach said Hill and secure any available testimony from him or from members of his party, this affiant took no steps in that direction.

But affiant further says that previous to the close of the late trial, outside of such conversation, he never learned of any person or persons, from the inquiries he was able to make, who had passed through the said river at any point below the El Paso Valley or any portion thereof.

Affiant says that, well knowing at that time that said Follett and said Hawkins were men likely to understand more of the history and conditions of said stream than anyone else, and believing both gentlemen to be speaking in good faith, he did not pursue further inquiry after such conversation, but relied upon the testimony he supposed he would be able to secure and did secure and furnish to the court upon said trial.

Affiant further says that he did not know and could not learn, as far as he was able to make inquiry, of any living men who had followed the course of said river from the bottom of the El Paso Valley through to the mouth of the Pecos and even further down the river than that, except as hereinbefore stated relative to Professor Hill and

42 his expedition, and that if he had been informed of the existence of such party he would at once have made the fact known.

Affiant further says that he did not learn of the knowledge of Mr. Clark and the other parties mentioned by him until after the case had been fully submitted to this honorable court several days, and that he then did not think it proper to make any mention of the fact, lest it

might be charged that he was seeking indirectly to influence the action of this honorable court upon the testimony and evidence already submitted.

And further affiant saith not.

(Signed) MARSDEN C. BURCH.

Sworn to and subscribed before me this 3rd day of January, A. D. 1900.

(Signed) JOS. P. RUDY,
Notary Public, D. C.

[SEAL.]

In the district court of the Territory of New Mexico, third judicial district.

UNITED STATES OF AMERICA, PLAINTIFF,	} No. 1243.
<i>vs.</i>	
THE RIO GRANDE DAM AND IRRIGATION Company et als., defendants.	

Affidavit of W. P. Sutton.

TERRITORY OF NEW MEXICO,
County of Bernalillo, ss:

W. P. SUTTON, of lawful age, being duly sworn, on oath deposes and says: That he was specially employed by the Attorney-General of the United States to assist the special United States attorney, Judge M. C. Burch, also a special attorney in said cause, in the preparation of the said cause for trial, which was set for the 12th day of December, 1899; that affiant was so employed on October 23rd, 1899, and from said date up to the present time; that on the said 23rd day of October, 1899, he proceeded to Washington, D. C., and thereupon proceeded to enter upon the preparation of the cause.

43 That about the first day of November, 1899, he reached Eagle Pass, Texas, and from there proceeded to Laredo, Texas, Rio Grande City, Texas, and Brownsville, Texas, in diligent search of witnesses who might testify as to the navigable capacity of said Rio Grande in past years, and down to the present time, and secured at each of said places various persons whose depositions were afterwards taken and used in said cause.

That owing to the extreme distance and difficulties of travel it was impossible for said affiant to obtain said depositions and to reach Las Cruces until the 10th day of December; that he had no time to make any stay or study in El Paso, Texas, and was not aware at that time, nor until and since the trial of said cause, that any evidence could be obtained in El Paso, Texas, and was informed during the trial of said cause by W. W. Follett, a person well experienced in such matters, and who was a member of the Boundary Commission, and who had charge of said river for several years in his official capacity, that so far as he knew no person had ever in recent years navigated said Rio Grande from El Paso any considerable distance down stream, except the witness McMahan, who had testified in person.

But that on the conclusion of the trial of this cause, said affiant proceeded to El Paso, Texas, and shortly thereafter discovered that Frank P. Clark, now a special deputy collector of customs at that place, had,

in company with three others, in the year 1881, made said journey, and said Clark detailed to this affiant the facts set forth in the affidavit of said Clark filed in this cause in support of the motion for rehearing.

That said affiant is informed and believed that M. C. Burch, said special attorney aforesaid, was after the 10th day of November, 1899, and for some time three weeks thereafter in and about El Paso, Texas, and diligently inquired of said Follett and others as to the facts relating to said Rio Grande, and that thereafter said Burch, on or about the first day of December, 1899, resorted to the City of Mexico in an earnest endeavor to there obtain witnesses as to the volume and flow of water in the Rio Concho, and other facts material to the trial of said cause, 44 and that said Burch only returned to El Paso on or about the 8th day of December, 1899, and accompanied affiant to Las Cruces on the 10th day of December, 1899.

Affiant gave no attention to the preparation for trial and procuring of evidence to be used on the trial of said cause at El Paso, and was only enabled to remain there a portion of Sunday, December 10th, 1899, leaving the procurement of such evidence at that point to the associate counsel, M. C. Burch.

Affiant verily believes that if the offer of the Government to establish gauging stations, as set forth in its motion for rehearing filed in this cause, is accepted and said measurements made, that the court will be enabled to determine definitely and with accuracy the amount of contribution to the navigability of the Rio Grande made by that stream by waters from above Elephant Butte, and at the same time the observations or readings heretofore made at Del Norte, Colorado, Embudo, Rio Grande, and San Marcial, N. M., can be continued and produced at the rehearing, and will assist in enabling the court to ascertain the loss between various points therein named, and thus to determine the facts material to the cause.

(Signed) WARNER P. SUTTON.

Subscribed and sworn to before me this the 2nd day of January, A. D. 1900.

[SEAL.]

(Signed) E. L. MEDLER,
Notary Public, Bernalillo County, New Mexico.

And be it further remembered that afterwards, to wit, on the 9th day of January, A. D. 1900, there was filed and entered of record in the said United States district court a final decree, which said final decree is in words and figures as follows, to wit:

In the district court of the United States for the third judicial district of the Territory of New Mexico, sitting for the trial of causes arising under the Constitution and laws of the United States.

THE UNITED STATES OF AMERICA, PLAINTIFF,	} No. 1243.
<i>vs.</i>	
THE RIO GRANDE DAM & IRRIGATION COM- pany et als., defendants.	

45 This cause coming on to be heard on the 9th day of January, A. D. 1900, on the motion for rehearing heretofore filed in this

cause by the plaintiff, and upon the affidavits of Marsden C. Burch, Warner P. Sutton, and Frank P. Clark, filed by the plaintiff in support of said motion, and the affidavit of Frank P. Clark, filed by the defendant in opposition thereto, all parties being before the court by their attorneys, and the court being advised as to the law and the premises, it is ordered, adjudged, and decreed by the court that the said motion of the plaintiff be, and the same hereby is, in all things overruled.

Now, this cause coming on again to be heard on the testimony, pleading, finding of facts heretofore made by the court and filed on January 2, 1900, and the record heretofore taken and made in this cause, all parties being present by their respective attorneys of record, and the argument of counsel being heard, and the court being fully advised as to the law and the premises, it is ordered, adjudged, and decreed by the court that the bill of complaint of the plaintiff herein be, and the same hereby is, dismissed.

It is further ordered, adjudged, and decreed by the court that defendants do have and recover of and from the plaintiff the cost of this suit, to be taxed by the register.

Whereupon the plaintiff, by its United States attorney, prays an appeal from the foregoing decree to the supreme court of the Territory of New Mexico; which appeal is hereby granted.

Done in chambers this 9th day of January, A. D. 1900.

(Signed) FRANK W. PARKER, *Judge, etc.*

Be it remembered that there were filed in the office of the clerk of the district court of the third judicial district pleadings, exhibits, and affidavits, as shown in the printed transcript of record following, from page 1 to 148, inclusive; said papers therein contained being filed in said office upon the dates therein specified, and that the said printed record contains all the pleadings, exhibits, and affidavits on file in said cause such as follow the same, and are expressly herein set out:

46 UNITED STATES OF AMERICA)
vs.
 THE RIO GRANDE DAM & IRRIGATION CO. ET AL.)

UNITED STATES OF AMERICA,
Territory of New Mexico:

In the district court of the third judicial district of the Territory of New Mexico, for the trial of causes arising under the laws of the United States.

To the Honorable Gideon D. Bantz, associate justice of the supreme court of the Territory of New Mexico, and judge of the third judicial district court thereof:

The United States of America, by Joseph McKenna, their attorney-general, and William B. Childers, United States attorney for the Territory of New Mexico, bring this, their bill of complaint against The Rio Grande Dam & Irrigation Company, a corporation duly organized under and in pursuance of the laws of the Territory of New Mexico, and having

its principal place of business in the town of Las Cruces, county of Doña Ana, in said Territory.

1. And thereupon your orators, complaining, say that the defendant, the said The Rio Grande Dam & Irrigation Company, had and has for the objects and purposes of its incorporation the construction and maintenance of dams and reservoirs, and canals, ditches, and pipe lines to the extent of from fifty miles to five thousand miles in the Territory of New Mexico; and, for the purposes of supplying water to be accumulated in practically illimitable quantity in said dams and reservoirs, canals, ditches, and pipe lines, it was and is the object and purpose of the said defendant company to construct and build dams across the Rio Grande River in the Territory of New Mexico at such certain points in the said river in said Territory that may be necessary to carry out the objects and purposes of said incorporation.

2. Your orators show that section 10 of the act of Congress of September 19th, 1890 (26 Stat., 454), is as follows, to wit:

"That the creation of any obstruction not affirmatively authorized by law to the navigable capacity of any waters in respect to which the United States has jurisdiction is hereby prohibited. The continuance of any such obstruction, except bridges, piers, docks, and wharves and similar structures, erected for business purposes, whether heretofore or hereafter created, shall constitute an offense, and each week's continuance of

47 any such obstruction shall be deemed a separate offense. Every person and every corporation which shall be guilty of creating or continuing any such unlawful obstruction in this act mentioned, or who shall violate the provisions of the last four preceding sections of this act, shall be deemed guilty of a misdemeanor, and on conviction thereof shall be punished by a fine not exceeding five thousand dollars, or by imprisonment (in the case of a natural person) not exceeding one year, or by both such punishments, in the discretion of the court. The creating or continuing of any unlawful obstruction in this act mentioned may be prevented and such obstruction may be caused to be removed by the injunction of any circuit court exercising jurisdiction in any district in which obstruction may be threatened or may exist; and proper proceedings in equity to this end may be instituted under the direction of the Attorney-General of the United States."

And that section 3 of the act approved July 13, 1892 (27 Stat., 110), is as follows, to wit:

"That it shall not be lawful to build any wharf, pier, dolphin, boom, dam, weir, breakwater, bulkhead, jetty, or structure of any kind outside of established harbor lines, or in any navigable waters of the United States where no harbor lines are or may be established, without the permission of the Secretary of War, in any port, roadstead, haven, harbor, navigable river, or other waters of the United States, in such manner as shall obstruct or impair navigation, commerce, or anchorage of said water; it shall not be lawful hereafter to commence the construction of any bridge, bridge draw, bridge piers, and abutments, causeway, or other works over or in any port, road, roadstead, haven, harbor, navigable river, or navigable waters of the United States, under any act of the legislative assembly of any State, until the location and plan of such bridge or other works have been submitted and approved by the Secretary of War, or to

excavate or fill, or in any manner to alter or modify the course, location, condition, or capacity of any port, roadstead, haven, harbor, harbor of refuge, or inclosure within the limits of any breakwater, or of the channel of any navigable water of the United States, unless approved and authorized by the Secretary of War: Provided, That this section shall not apply to any bridge, bridge draw, bridge piers, and abutments, the construction of which has heretofore been duly authorized by law, or be so construed as to authorize the construction of any bridge, drawbridge, bridge piers, and abutments, or other works under the act of the legislature of any State over or in any stream, port, roadstead, haven, or harbor, or other navigable water not wholly within the limits of such State."

3. Your orators further show and complain that the said defendant company are particularly and immediately about to commence and create, and intend and threaten to commence and create, an unlawful obstruction in the said Rio Grande River by constructing a dam in and across said river at a point called Elephant Butte, in the Territory of New Mexico and in the third judicial district thereof, the same being one hundred and twenty-five miles north and slightly west of the city of El Paso, in the State of Texas, for the purpose of storing water in a large quantity to carry out the purposes of said incorporation, as before in this bill mentioned.

48 4. Your orators further show that the said Rio Grande River, from and including the sight of the proposed said dam and construction by the said defendant company, has been used to float logs for commercial and business purposes and for affording a means for commercial traffic within and between the Territory of New Mexico and the State of Texas, in the United States of America and the Republic of Mexico; that the first material addition to the volume of water of the said Rio Grande River is at a point three hundred and twenty-five miles below the site of the said proposed dam and construction by said defendant company, where the Rio de los Conchos, or Conchos River, empties into said Rio Grande River; and that the said Rio Grande River is a navigable stream and used as such in interstate commerce from the mouth of said Conchos River, in the Republic of Mexico, to the city of El Paso, State of Texas, in the United States of America, a distance of two hundred miles.

5. And further, that the navigability of the said Rio Grande River at the city of El Paso aforesaid has been recognized and acknowledged heretofore by the Congress of the United States and Secretary of War of the United States.

6. And further, that the said Rio Grande River, from the city of El Paso aforesaid up to and beyond the site of the dam proposed and threatened to be commenced and constructed by the said defendant company, as aforesaid, carries a greater quantity of water than it carries at the said city of El Paso, and by reason of the conformation of the bed and banks, and the channel thereof, makes navigation of such last-mentioned portion of said river a feasible accomplishment.

7. And further, that such proposed dam will be such a one as will check the flow of water in the said Rio Grande River at the said point of Elephant Butte entirely for a greater portion, if not the entire year, and impound it; and that such distribution of the waters of said river

from within said proposed dam at said Elephant Butte, as contemplated, intended, threatened, and about to be attempted, commenced, begun, and created, and constructed by said defendant company, as aforesaid, will practically destroy the said river as a stream for many miles below said point at said Elephant Butte, and the volume of the water below said proposed dam so diminished by the construction and uses thereof, as aforesaid, as to materially effect the navigability of said Rio Grande River and impair navigation and commerce throughout its entire course from said proposed dam at Elephant Butte to the Gulf of Mexico.

49 8. And further, that the creation of an obstruction to the navigable capacity of said river, by the building of said proposed dam, as above described, by the defendant company, is not affirmatively authorized by law, nor has any such authorization been given.

9. And further, that the proposed building and construction of the said proposed dam by said defendant company is without the permission, authority, or approval of the Secretary of War of the United States.

10. Your orators complaining, show further, that the said defendant company, by means in part of said dam, to be constructed as aforesaid, proposes to create the largest artificial lake in the world, to obtain control of the entire flow of the Rio Grande River in the southern part of the Territory of New Mexico, hereinbefore described, the same being the only practical river for irrigating said portion of said Territory; by controlling said river, as aforesaid, to control to a great extent the irrigable land adjacent thereto in said district and Territory; to subject the owners of irrigable lands therein to a perpetual water rent; to obtain possession, by means of the practically exclusive power of water rights in a partially arid region of the United States, of large tracts of irrigable land in said portion of said Territory; to secure a monopoly of all the water suitable for irrigation in said Territory contiguous to the said river below the site of said proposed dam.

Your orators therefore pray that the said defendant may be compelled to answer, all and singular, the premises in this bill (but not under oath, the answer under oath being hereby expressly waived), and that the defendant, The Rio Grande Dam & Irrigation Company, may be restrained from beginning, commencing and attempting, building, constructing, creating or maintaining any dam, breakwater, weir, structure, or obstruction of any character whatsoever across the Rio Grande River in the waters thereof in the Territory of New Mexico, and especially at Elephant Butte, or at any point thereon in said judicial district, or in any manner to begin the construction of, or to construct or create any structure, dam, or other obstruction of any character whatsoever in such manner and to such extent as shall effect the navigable capacity of said Rio Grande River in said Territory of New Mexico. Your orators pray that your honor may grant a writ of injunction, issuing out of and under the seal of this honorable court, perpetually enjoining and restraining the said defendant, The Rio Grande Dam & Irrigation Company, its employes and agents, or anyone under its authority, for or by them, from any or further creating, constructing or maintaining or beginning the construction of any obstruction to the navigability of the waters of said river by any of the means in this bill and in this section hereinbefore set forth.

50 And your orators further pray that a provisional or preliminary injunction be issued restraining the said defendant, The Rio Grande Dam & Irrigation Company, from the beginning, commencement, attempting, building, creating, obstructing, or maintaining any obstruction to the navigability of said waters of and across the said Rio Grande River, and in the said waters thereof, in said Territory, by any of the means heretofore mentioned in this bill, to wit, by means of a dam, breakwater, weir, piles, structure, or other obstruction.

And for such other and further relief as the circumstances, nature, and equity of the case may require and to your honor shall seem meet.

Therefore, that your honor will grant unto your orators the writ of subpoena in chancery, issuing out of and under the seal of this court, to be directed to the said The Rio Grande Dam and Irrigation Company, commanding it to appear on Monday, the 7th day of June, A. D. 1897, before your honor, in the court aforesaid, then and there to show cause, if any it have, why a perpetual injunction should not be issued against it in this behalf, as prayed for in this bill, and then and there answer the premises and abide the order and decree of the court.

JOSEPH McKENNA,

Attorney-General of the United States.

By direction of the Attorney-General:

W. B. CHILDERS,

United States Attorney for New Mexico.

GEO. P. MONEY,

Assistant United States Attorney for New Mexico.

TERRITORY OF NEW MEXICO, *County of Bernalillo, ss:*

I have read the foregoing petition, by me subscribed, and the facts stated therein are true, to the best of my information and belief.

GEO. P. MONEY,

Assistant United States Attorney for New Mexico.

Subscribed and sworn to before me this the 22nd day of May, A. D. 1897.

[SEAL.]

E. L. MEDLER, *Notary Public.*

Upon the filing and reading of the foregoing bill of complaint in the foregoing cause, it is ordered that a temporary writ of injunction issue against the defendant, The Rio Grande Dam & Irrigation Company, as prayed for in said bill, and it is further ordered that
51 said defendant show cause, if any it have, before me in chambers, on Monday, the 14th day of June, 1897, why said injunction should not be continued in force until the final hearing of the cause, or should be dissolved.

GIDEON D. BANTZ, *Judge.*

Done in chambers this the 24th day of May, A. D. 1897.

In the United States district court of the third judicial district of the Territory of New Mexico.

THE UNITED STATES OF AMERICA	}	No. 140. Chan-
vs.		
THE RIO GRANDE DAM & IRRIGATION COM- pany.		

Upon the filing and reading of the bill of complaint in this cause, it is ordered that a temporary writ of injunction issue against the defendant, The Rio Grande Dam & Irrigation Company, as prayed for in said bill, and it is further ordered that said defendant show cause, if any it have, before me in chambers, on Monday, the 14th day of June, 1897, why said injunction should not be continued in force until the final hearing of this cause, or should be dissolved.

GIDEON D. BANTZ, *Judge*.

Done in chambers this the 24th day of May, A. D. 1897.

UNITED STATES OF AMERICA,

Territory of New Mexico, Third Judicial District:

I, W. B. Walton, clerk of the district court of the third judicial district of the Territory of New Mexico, do hereby certify that the above and foregoing is a true and correct copy of the order granting a temporary injunction and ordering the defendant to show cause why it should not be continued in force, made and entered of record in the above-entitled cause.

Witness my hand and the seal of said third judicial district court, at Silver City, New Mexico, this 25th day of May, A. D. 1897.

[SEAL.]

W. B. WALTON, *Clerk*.

TERRITORY OF NEW MEXICO, *County of Doña Ana:*

Within order to show cause came to hand May 30th, 1897, and was duly executed by me on the 31st day of May, 1897, by delivering a true and correct copy hereof to Phœbus Freudenthal, at his place of business at Las Cruces, in said county and Territory, the said Phœbus Freudenthal being one of the directors of the Rio Grande Dam & Irrigation Company, the within-named defendants, and the only officer of said company to be found in Doña Ana County.

E. L. HALL, *Marshal*.

By E. E. BANNER, *Deputy*.

52 *The United States of America to The Rio Grande Dam & Irrigation Company, greeting:*

You are hereby commanded that, laying all other matters and things aside, you do cause an appearance to be entered for you in the United States district court of the third judicial district of the Territory of New Mexico, in chancery sitting, on the first return day occurring not less than twenty days after service hereof, if the defendant served is a resident of said judicial district, or on the first return day occurring not less than thirty days after service hereof, if the defendant served is not a resident of said judicial district, then and there to answer unto a bill filed

against you by the United States of America, and that you do answer concerning such things as shall then and there be alleged against you, and observe what the said court shall direct in this behalf, on pain of such process of contempt as said court shall award; the first Monday in each month being a return day, and each defendant being required to enter an appearance in the office of the clerk of said court on or before the return day on which this writ is returnable; otherwise the bill herein may be taken pro confesso.

Witness the Hon. Gideon D. Bantz, associate justice of the supreme court of the Territory of New Mexico, and presiding judge of the third judicial district courts thereof, and the seal of said court at Silver City, New Mexico, this 25th day of May, A. D. 1897.

[SEAL.]

W. B. WALTON,
Clerk and Register.

This is a suit in chancery commenced by complainant against defendant, praying that the said defendant may be restrained from beginning, commencing, and attempting, building, constructing, creating, or maintaining any dam, breakwater, weir, structure, or obstruction of any character whatsoever, across the Rio Grande River in the waters thereof, in the Territory of New Mexico, and especially at Elephant Butte or any point thereon, in said judicial district, or in any manner to begin the construction of or to construct or create any structure, dam, or other obstruction of any character whatsoever, in such manner and to such extent as shall affect the navigable capacity of said Rio Grande River in said Territory of New Mexico; complainant also prays for perpetual injunction, enjoining and restraining defendant, its employes and agents or anyone under its authority, for or by them, from any or further creating, constructing, or maintaining, or beginning the construction of any obstruction to the navigability of the water of said river by any of the means in

53 said bill set forth; complainants also pray for a provisional or temporary injunction restraining defendant from the beginning, commencement, attempting, building, creating, or obstructing or maintaining any obstructions to the navigability of said waters of and across the said Rio Grande River, and in the said waters thereof, in said Territory, by any of the means hereinbefore mentioned, for general relief.

[SEAL.]

W. B. WALTON,
Clerk and Register.

TERRITORY OF NEW MEXICO,
County of Doña Ana;

Within writ came to hand May 30th, 1897, and was duly executed by me on the 31st day of May, 1897, by delivering a true and correct copy hereof to Phœbus Freudenthal at his place of business at Las Cruces in said county and Territory, the said Phœbus Freudenthal being one of the directors of the Rio Grande Dam & Irrigation Company, the within-named defendants, and the only officer of said company to be found in Doña Ana County.

E. L. HALL, *Marshal.*
By E. E. BANNER.

The United States of America to the Rio Grande Dam & Irrigation Company, greeting:

Whereas the United States of America have filed their certain bill in chancery in the United States district court of the third judicial district of the Territory of New Mexico against you, the said The Rio Grande Dam & Irrigation Company, your employes and agent, or any one under your authority, defendants to be relieved touching the matters therein complained of and which said bill is still there pending.

We, therefore, in consideration of the premises and of the particular matters in said bill set forth, do strictly enjoin and command you, the said The Rio Grande Dam & Irrigation Company, your employes and agents, or any one under your authority, and each and every one of you, under the penalty of the law thence ensuing, that you and every one of you, do absolutely desist and refrain from beginning, commencing, attempting, building, constructing, creating or maintain any dam, breakwater, weir, structure, or obstruction of any character whatsoever, across the Rio Grande River in the waters thereof, in the Territory of New Mexico, and especially at Elephant Butte, or at any point thereon in said judicial district, or in any manner to begin the construction of, or to construct or create, any structure, dam, or other obstruction of any character whatsoever, in such manner and to such extent as shall affect the navigable capacity of said Rio Grande River in said Territory of New Mexico, until the further order of this court.

Witness the Hon. Gideon D. Bantz, associate justice of the supreme court of the Territory of New Mexico, and presiding judge of
54 the third judicial district courts thereof, and the seal of said court at Silver City, New Mexico, this 25th day of May, A. D. 1897.

[SEAL.]

W. B. WALTON,
Clerk and Register.

TERRITORY OF NEW MEXICO,
County of Doña Ana;

Within writ of injunction came to hand May 30th, 1897, and was duly executed by me on the 31st day of May, 1897, by delivering a true and correct copy hereof to Phoebe Freudenthal at his place of business at Las Cruces, in said county and Territory, the said Phoebe Freudenthal being one of the directors of The Rio Grande Dam & Irrigation Co., the within-named defendants, and the only officer of said company to be found in Doña Ana County.

E. L. HALL, *Marshal.*
By E. E. BANNER, *Deputy.*

UNITED STATES OF AMERICA,
Territory of New Mexico.

In the district court of the third judicial district of the Territory of New Mexico, for the trial of causes arising under the laws of the United States.

To the Honorable Gideon D. Bantz, Associate Justice of the Supreme Court of the Territory of New Mexico, and Judge of the Third Judicial District Court thereof:

1. The United States of America, by Joseph McKenna, their Attorney-General, and William B. Childers, United States attorney for the Terri-

tory of New Mexico, bring this their amended bill of complaint, by leave of the court, against The Rio Grande Dam & Irrigation Company, a corporation duly organized under and in pursuance of the laws of the Territory of New Mexico, and having its principal place of business in the town of Las Cruces, county of Doña Ana in said Territory, and The Rio Grande Irrigation and Land Company, Limited, a corporation organized under and by virtue of the laws of Great Britain, having its principal office in the city of London, England, and also being engaged in doing business in the said Territory of New Mexico. Thereupon the complainant alleges and says that the original defendant, the said Rio Grande Dam & Irrigation Company, is incorporated under the laws of the Territory of New Mexico, and has for the object and purposes of its incorporation as such has proposed the construction and maintainance of dams, reservoirs, ditches, canals, and pipe lines.

2. The complainant further alleges, as it is informed and believes, that the said original defendant intends and gives out that it will construct from fifty to five thousand miles of canals, ditches, and pipe lines in said Territory of New Mexico, State of Texas, and Republic of Mexico,

55 as set forth in its articles of incorporation and that in pursuance of the purposes of incorporation it gives out that it is about to construct dams across the Rio Grande in the Territory of New Mexico, at such certain points in said river in said Territory as may be necessary to carry out the said objects and purposes of this incorporation and proposes to accumulate and impound waters from said river in unlimited quantities in said dams and reservoirs, and distribute the same through said canals, ditches, and pipe lines.

3. The complainant further alleges that it is informed and believes that the defendant, the Rio Grande Irrigation and Land Company, Limited, was organized under the laws of Great Britain as an adjunct and agent of the original defendant, the Rio Grande Dam & Irrigation Company, and for the purpose of securing capital for promoting the construction of said dams, reservoirs, canals, ditches, and pipe lines, and that the said original defendant, the Rio Grande Dam & Irrigation Company, has entered into a contract or agreement for the conveyance to its codetendant, hereinafter designated as the English Company, of some rights in and to said dams, reservoirs, canals, ditches, and pipe lines, to be constructed as aforesaid, or for the conveyance of their rights in and to said dams, reservoirs, ditches, canals, and pipe lines, the exact language and purport and legal effect of which said contracts, agreement, or conveyances are unknown to complainant. The complainant further alleges that it is informed that the same is of record in the office of the probate clerk, ex officio recorder of the county of Sierra and Territory of New Mexico, a copy of which it asks leave to file herewith and make a part of this amended bill, as soon as the same can be procured, to be marked "Exhibit A."

4. The complainant further alleges, upon information and belief, that the said defendant, the Rio Grande Irrigation and Land Company, Limited, as agent, lessee, assignee, or under whatever relation may exist between it and the said original defendant, as hereinbefore alleged, has attempted to exercise and has claimed the right to exercise all the rights, privileges, and franchises of the said original defendant, and has given out as its

objects as said agent, lessee, or assignee, as aforesaid, to construct said dams, reservoirs, ditches, and pipe lines and take and impound the water of said river, and thereby to create the largest artificial lake in the world and to obtain control of the entire flow of the said Rio Grande and divert and use the same for the purposes of irrigating large bodies of land, and to supply water for cities and towns, and for domestic and municipal purposes, and for milling and mechanical power.

5. The complainant further alleges that the Rio Grande receives no addition to its volume of water between the projected dam and the mouth of the Conchos River, about three hundred miles below, and that
56 the said Rio Grande, from the point of said projected dam to the mouth of the Conchos River, throughout almost its entire course from the latter part to its mouth, flows through an exceedingly porous soil, and that the atmosphere of the section of the country through which said river flows, from the point above the dam to the Gulf of Mexico, is so dry that the evaporation proceeds with great rapidity and that the impounding of the waters will greatly increase the evaporation, and that from these causes but little water, after it is distributed over the surface of the earth, would be returned to the river.

6. The complainant further alleges that said river is navigable and has been navigated by steamboats up to the town of Roma, in the State of Texas, about three hundred and fifty miles from its mouth, and is susceptible of navigation and has been navigated above Roma to a point about one hundred and fifty miles below El Paso, in the State of Texas. The complainant further alleges that the navigability of said river is interfered with at the last-mentioned point by some falls or rapids, and that the said river above said falls or rapids is susceptible of navigation up to La Joya, in the Territory of New Mexico, about one hundred miles above Elephant Butte, where defendants propose to construct said dam; and said complainant further alleges that the said river between said rapids and said town of La Joya has at different times been used for the purposes of floating and transporting rafts, logs, and poles, and that the said portion of said stream is susceptible of being used and navigated for commercial purposes. And the complainant further alleges that the said river is navigable and susceptible of being navigated as aforesaid for carrying on commerce between the Territory of New Mexico, the State of Texas, and the Republic of Mexico.

7. The complainant further alleges that the impounding of the waters of said river by the construction of said dam and reservoir at said point, called Elephant Butte, about one hundred and twenty-five miles above the city of El Paso, said point being in the Territory of New Mexico, and the diversion of the said waters and the use of the same for the purposes hereinbefore mentioned will so deplete and prevent the flow of the water through the channel of said river below said dam, when so constructed, as to seriously obstruct the navigable capacity of the said river throughout its entire course from said point at Elephant Butte to its mouth.

8. Complainant further alleges that the construction of said dam has never been affirmatively authorized by law, and the plans and
57 specifications for the construction of the same have not been submitted to the Secretary of War for his approval, and the location

and plans have not been submitted and approved by him; and the complainant further alleges that no dam or other obstruction to the navigable capacity of any waters can be lawfully constructed until the same have first been affirmatively authorized by law and until the location and plans for such obstruction have been submitted and approved by the Secretary of War.

9. The complainant further alleges that the navigability of the said Rio Grande at the city of El Paso, State of Texas, has been recognized and acknowledged by the Congress of the United States and the Secretary of War of the United States.

The complainant further alleges that by the treaty the Government of the United States of America and the Republic of Mexico have, by treaty stipulation, agreed and declared that the Rio Grande, from the southern boundary of the Territory of New Mexico to its mouth, shall be free and common to the vessels and citizens of both countries, and that neither country shall, without the consent of the other, construct any work that may impede or interrupt, in whole or in part, the exercise of said right of free navigation, and that neither party of said treaty have consented or authorized the construction of said dam.

Complainant files herewith the articles of incorporation of said original defendant as a part of this bill of complaints, marked "Exhibit B."

Wherefore the complainant being remedyless except in a court of equity, where such matters are remedial, the complainant prays that a subpoena in chancery be directed to said defendants, the Rio Grande Dam & Irrigation Company and the Rio Grande Irrigation and Land Company, Limited, requiring them to be and appear before this honorable court, at a time and place to be therein named, to answer all and singular the premises, but not under oath (answers under oath being hereby expressly waived), and that the said defendants, the Rio Grande Dam & Irrigation Company and the Rio Grande Irrigation and Land Company, Limited, may be restrained from beginning and commencing or attempting to construct or build said dam and reservoir or any other dam, breakwater, reservoir, or other structure, or obstruction of any character whatsoever, across the Rio Grande or the waters thereof, or from maintaining such dam or obstruction in the Territory of New Mexico, and especially at Elephant Butte in said Territory, or any other point on said river in said Territory of New Mexico, as shall effect the navigable capacity of said Rio Grande at any point throughout its course, whether in the Territory of New Mexico or elsewhere, and that the temporary injunction heretofore granted against said original defendant be continued.

And the complainant prays that it shall have such other and further relief in the premises as equity may require and to your honor shall seem meet.

58 The complainant further prays that a temporary injunction be issued and directed to the said defendants, the Rio Grande Dam & Irrigation Company, and the Rio Grande Irrigation and Land Company, Limited, restraining and enjoining them and each of them from beginning, commencing, and attempting to construct or build said dam and reservoir or any other dam, breakwater, reservoir, or other structure or obstruction, of any character whatsoever, across the Rio Grande or the

waters thereof, or from maintaining such dam or obstruction in the Territory of New Mexico, and especially at Elephant Butte, in said Territory, or any other point on the line of said river in said Territory of New Mexico as shall effect the navigable capacity of said Rio Grande at the further orders of this honorable court, and that upon the final hearing of this cause that said injunction shall be perpetual.

JOSEPH McKENNA,
Attorney-General of the United States.

W. B. CHILDERS,
United States Attorney for the Territory of New Mexico.

In the district court of the third judicial district of the Territory of New Mexico.

UNITED STATES OF AMERICA, COMPLAINANT,	} No.
<i>vs.</i>	
THE RIO GRANDE DAM & IRRIGATION COMPANY et al., defendants.	

Affidavit of W. B. Childers, United States Attorney.

TERRITORY OF NEW MEXICO,
County of Bernalillo, ss:

WILLIAM B. CHILDERS, of lawful age, being duly sworn, upon oath deposes and says: That he is United States attorney for the Territory of New Mexico; that under instructions from the Attorney-General of the United States he communicated by letter with the defendant, The Rio Grande Dam & Irrigation Company, at Las Cruces, New Mexico, stating to them that he, affiant, had been instructed to prevent said company from erecting a dam across the Rio Grande at a place called Elephant Butte, in the Territory of New Mexico, about one hundred and twenty-five miles above El Paso, and that it had been reported that said company was about to commence work, and requested an answer to his communication. A few days afterwards the defendant company wired affiant that it did propose to commence the erection of said dam at said point. Thereupon affiant instructed George P. Money, assistant United States attorney, to file suit to enjoin the construction of said dam and reservoir, whereupon the original bill in this cause was filed. Affiant further says that he is officially informed and believes that the erection of said dam and reservoir has not been authorized by the Secretary of War, and that the same is not affirmatively authorized by law.

59 Affiant further states that from his knowledge of geography and information acquired from books of reference and official reports made by officials of the Government of the United States that the said Rio Grande is a navigable stream for a considerable distance above its mouth, and therefore states positively that such is the fact.

Affiant further states that from documentary evidence on file in the Department of State at Washington, copies of which have been furnished him, that the said river is susceptible of navigation and has been navigated to a point about one hundred and fifty miles below El Paso, in the State of Texas, as alleged in the amended bill of complaint filed in this

cause. Affiant further states that he has been reliably informed and believes that said river has been used above said point in the past for the purpose of floating logs down the stream to the city of El Paso, and that he is also informed and believes that said river has been recently so used for floating telegraph poles for a short distance a little below the town of La Joya, which is situated on said river in the county of Socorro, New Mexico.

Affiant further states that from an examination of the reports of W. W. Follett, engineer of the International Water Boundary Commission, organized pursuant to treaty between the Government of the United States and the Republic of Mexico, that the amount of water in said river has been greatly depleted and diminished within the past ten or twelve years by reason of the diversion for the purpose of irrigation by ditches and otherwise of large amounts of water in Colorado and New Mexico above the point where the said defendant company proposes to construct the said dam; that said depletion and diminution has seriously affected the navigable capacity of the said river at said point called Elephant Butte and below there.

Affiant further states that upon the hearing on the rule to show cause why the temporary injunction issued in this cause should not be continued he will present in support of this affidavit the original, or copies properly certified, of the documents above referred to, together with others, to sustain the allegations made upon information and belief in this case.

Affiant further says that from an examination of the certified copies of the articles of incorporation of said Rio Grande Dam & Irrigation Company, which said certified copy he proposes to present upon said hearing, he is informed and believes that the purposes of the said defendant company are to construct said dam and a line of ditches and canals and pipe lines, to begin at the dam or dams to be built by said company across the Rio Grande River at a place or various and several places within township thirteen (13) and fourteen (14) and ranges three (3) and four (4) west, in Sierra County, New Mexico, and to terminate at any point or place and various and several places in the Territory of New Mexico, State of Texas, and Republic of Mexico, to which it may be practicable to carry the waters so accumulated, and that the length of said canals and ditches to be from fifty miles to five thousand miles.

Affiant further states that the Rio Grande Irrigation and Land Company, Limited, made a codefendant by the amended bill filed in this case, as he is informed and believes, has the contract relation set up and alleged in the amended bill filed in this case with the said original defendant, The Rio Grande Dam & Irrigation Company, and was organized for the purpose of constructing or promoting the construction of said improvements above described, either by actually constructing the same or by raising the necessary capital therefor; and that said company, according to the prospectus issued by it, was formed to acquire, by lease and assignment, the franchises, rights, water rights, and rights to appropriate the waters of the Rio Grande, contracts, purposes, and undertakings of the said defendant, The Rio Grande Dam & Irrigation Company, and for the purpose of irrigating, colonizing, and improving the lands in the Rio Grande Valley between Engle, New Mexico, and Fort Quitman, Texas,

and affiant files herewith and makes a part of this affidavit a copy of the prospectus issued by said defendant, the Rio Grande Irrigation and Land Company, Limited.

Affiant further states that by the terms of an act of Congress passed on the 6th day of September, A. D. 1888, and of an act of Congress approved July 28th, 1882, the Rio Grande was treated and recognized as a navigable stream at the city of El Paso, in the State of Texas, and that the Secretary of War has recognized it as a navigable stream, and so treats it, and has requested the Department of Justice to take such proceedings as may be necessary to prevent the construction of said dam and reservoir.

WILLIAM B. CHILDERS,

Subscribed and sworn to before me this the 19th day of June, A. D. 1897.

[SEAL.]

E. L. MEDLER,
Notary Public, Bernalillo County, New Mexico.

[Private and confidential.]

Sufficient of this issue having been guaranteed, the directors will proceed to allotment on or before the day of April, 1896.

Rio Grande Irrigation and Land Company, Limited.

Incorporated under the companies acts, 1862 to 1893, by which the liability of the shareholders is limited.

Capital £500,000

In 100,000 8 per cent cumulative preference shares of £1 each, and 400,000 ordinary shares of £1 each.

61 Issue of £100,000 in 8 per cent cumulative preference shares of £1 each, and £100,000 in ordinary shares of £1 each.

Payable 2s. 6d. on application, 7s. 6d. on allotment, and the balance as required.

The preference share issue is preferential both as to capital and dividend, and after 8 per cent has been paid on the ordinary shares, ranks *pari passu* share for share with the ordinary shares in the surplus annual profits.

Issue of 1,000 first-mortgage debentures of £50 each (part of authorized issue of £100,000), bearing interest at five (5) per cent per annum, payable half-yearly on the 1st day of January and the 1st day of July in each year. Redeemable at £55 on the 1st of January, 1916, or previously on six months' notice.

The debentures are offered at £52 10s per £50 debenture bond, payable as follows:

£5 on application.	£10	3 months after allotment.
5 on allotment.	25	6 months after allotment.
7-10-0 1 month after allotment.	<hr/>	
	£52-10-0	

The debentures will be secured by a trust deed creating a first mortgage in favour of the trustee for the debenture holders on, first, certain exclusive privileges and franchises granted by the Government of the United

States of America for the creation of dams, weirs, ditch heads, canals, and other works in connection with irrigation and right of appropriating the waters of the Rio Grande. Second, the dams, weirs, ditch heads, canals and reservoirs and other irrigation works to be constructed. In addition thereto debenture holders will further be secured by a floating charge created by the said trust deed on all the other assets of the company, both present and future, including (a) the lands which shall hereafter be acquired in exchange for water rights, the plant and contracts, and the unsold water rights for the time being; (b) the income derived from water rents and other sources.

In the trust deed provision will be made for a sinking fund sufficient to redeem the debentures at maturity, or whenever prior thereto they may be paid off as provided in the said trust deed, and a sum adequate for the payment of interest for two years from January 1st, 1896, a period deemed fully ample for construction, will be invested in consols by the vendor company, in the name of the trustee for the debenture holders.

Trustee for the debenture holders: The National Safe Deposit Company, Limited, Marquis of Tweeddale (chairman), 1 Queen Victoria street, Mansion House, London, E. C.

Directors: The Right Hon. The Earl of Winchelsea and Nottingham, Haverholme Priory, Sleaford.

The Right Hon. Lord Clannorris, Bangor Castle, Belfast.

Lord Ernest W. Hamilton, Coates Castle, Pulborough, Sussex.

Robert J. Price, M. P., 104 Sloane street, S. W.

Colonel W. J. Engledue, Petersham Place, Byfleet (late R. E. & late an engineer in chief & manager Indian State Ry's.).

John Ferguson, 14 St. George's Square, S. W. (Ramage & Ferguson, Ltd.), shipowner & shipbuilder, Leith.

* Nathan E. Boyd, Kilmarnock House, Kenley, Surrey (president Mesilla Valley Irrigation Colony, New Mexico).

* R. Chetham-Strode, Fairholme, Pinner, Middlesex.

Local directors: The Hon. W. T. Thornton (governor of New Mexico).

Edwin C. Roberts (director, the Rio Grande Dam & Irrigation Company, U. S. A.).

Joshua S. Reynolds (president First National Bank, El Paso, Texas).

John M. Yair (director, Mesilla Valley Fruit and Vine Growing Company, Limited).

Henry D. Bowman (Bowman & Sons, bankers, Las Cruces, N. M.).

Bankers: The Royal Bank of Scotland, St. Andrew Square, Edinburgh; 123 Bishopsgate street Within, London, E. C., and branches. (For the company.)

Messrs. Brown, Janson & Co., 32 Abchurch Lane, London, E. C. (For the trustee.)

Local bankers: First National Bank, El Paso, Texas; Bowman & Sons, Las Cruces, New Mexico.

Brokers: Messrs. R. B. Smith & Co., 10 Throgmorton avenue, and Stock Exchange, London, E. C.

Mr. J. Souter Sanderson, 10a North St. David street, and Stock Exchange, Edinburgh.

* Shareholders in and representing the vendor company.

Mr. Douglas Cairney, 45 West Nile street, and Stock Exchange, Glasgow.

Messrs. Marsland & Chew, 4 St. Ann's Square, and Stock Exchange, Manchester.

Messrs. Godfrey & Laws, 12 Mount Stuart Square, Cardiff.

63 Auditors: Messrs. Ford, Rhodes & Ford, 81 Cannon street, London, E. C.

Engineer: John L. Campbell, C. E.

Solicitors (to the company): Messrs. Nicholson, Graham & Graham, 24 Coleman street, London, E. C.; Messrs. Davis, Beall & Kemp, El Paso, Texas, U. S. A.

Solicitors (to the Vendor Company): Messrs. Minet, Pering, Smith & Co., 81 Cannon street, London, E. C.

Solicitors (to the trustee): Messrs. Ashurst, Morris, Crisp & Co., 17 Throgmorton avenue, London, E. C.

Registered office of the company: 34 Victoria street, Westminster.

Secretary (pro tem): N. P. Allison.

PROSPECTUS.

This company has been formed to acquire, by lease and assignment, the franchise rights, water rights, right of appropriating the waters of the Rio Grande (U. S. A.), contracts, properties, and undertaking of the Rio Grande Dam & Irrigation Company, and for the purposes of irrigating, colonizing, and improving the lands in the famous Rio Grande Valley, between Engle, New Mexico, and Fort Quitman, Texas.

The Vendor Company was incorporated in 1893, under the laws of New Mexico, U. S. A., to construct irrigation works, and consolidate, under one corporate body, certain irrigation rights and interests in the Rio Grande Valley, in southern New Mexico and El Paso County, Texas.

In the Rio Grande Valley the inexhaustible fertility of the soil, the capabilities for irrigating with the fertilising waters of the Rio Grande—the Nile of America—combined with the exceptionally fine climate, so peculiarly adapted to fruit and vine culture, and the superior railway facilities (five important railways centre in this valley at El Paso), present unequaled advantages for profitable fruit farming and vine growing.

Fruit farmers and vine growers in the Rio Grande Valley are about 1,200 miles nearer than the California growers to Chicago and the Eastern markets, and fruit grown in the Rio Grande Valley matures several weeks earlier.

The soil is alluvial, and analysis shows it to be admirably suited to the production of all kinds of fruits, cereals, and vegetables. Under
64 irrigation phenomenal crops are obtained, the rich chocolate loam affording a yield remarkable both for quantity and quality.

The Rio Grande Valley has been pronounced by French experts to have few rivals as a fruit, raisin, and wine producing country, and is now recognized by eminent European and American medical authorities as a most favored sanitarium for those suffering from pulmonary and throat troubles. "Almost perpetual sunshine, cool summers, warm winters—average 63 degrees—considerable elevation—altitude from 3,500 to 4,000 feet—and a dry aseptic atmosphere."

The completion of the company's system of canals will bring 230,000 acres of valley lands under ditch, and by the construction of the high-level canal about 300,000 acres of magnificent mesa (low-lying table-lands) can be irrigated. (Vide engineer's report.)

The amount of fertile alluvial lands capable of being irrigated by the company's canals when completed is only limited by the flow of the Rio Grande, which is one of the largest of the American rivers. Though the greatest flow of the river occurs during the months of April, May, June, and July, just when the orchards and vineyards most require irrigation, the storage of water is necessitated because the minimum flow of the river generally occurs about the end of the cropping season, when some irrigation is still requisite, and because an adequate supply of water must also be insured for irrigation in the early spring when the river is low.

The Vendor Company has secured, under United States Federal law, the only feasible reservoir site on the Rio Grande, in southern New Mexico, and the completion of the storage dam at Elephant Butte will create the largest artificial lake in the world (11,036,722,000 cubic feet), at a cost of 4s. 9d. per acre-foot (capacity), as compared with the cost of the Sweetwater dam (California), £8 10s. 5d. per acre-foot; the Merced Valley dam (California), £5 10s. 10d.; Castlewood dam (Colorado), £7 10s. 4d. per acre-foot. (Vide the engineer's report.)

In acquiring this splendid natural reservoir site the company will obtain control of the entire flow of the Rio Grande in southern New Mexico, the only practicable means of irrigating what is now considered to be the finest fruit and vine country in the United States.

In controlling the water the company will, to a great extent, control the irrigable lands.

Many of the owners of irrigable lands in the valley have already contracted to convey to the Vendor Company one-half of their lands in return for water rights to the other half and to pay a water rent of \$1.50 (6s.) per acre per annum for every acre of their land irrigated. A water right is the perpetual right to the use of water for irrigation purposes, at a fixed annual rental per acre irrigated, and is inalienable from the land to which the water right pertains.

65 Obviously the remaining landowners must, in order to render their properties of value, concede a large portion of their lands for water rights, or purchase the said water rights, at the ruling rate, from the company.

By exchanging water rights for lands it is estimated that the company will obtain in fee simple within two years not less than 40,000 acres of irrigable valley lands; and by constructing the proposed high level canal quite two-thirds of the vast mesa lands can be secured by the company from the Government and ranch owners upon even more advantageous terms.

The mesa lands, like the valley lands, are alluvial deposits, level, clear, and ready for the plough, equally as suitable for fruit and vine culture as the valley, but on a higher level than the valley lands proper.

The 40,000 acres of valley land, if sold, with water rights, as low as £10 per acre, will return the company £400,000. California irrigable lands sell for £20, £50, and £100 per acre; and the Mesilla Valley Irrigation Colony, located on the Rio Grande in the Mesilla Valley, a sub-

division of the Rio Grande Valley to be irrigated from the company's canals, is rapidly selling its lands at £20 per acre and upwards.

The revenue of the company will be derived principally from the sale of lands and water rights, from water rents, from the supplying of water to cities and towns for domestic and municipal purposes, and for milling and mechanical power, for which there is a large and constantly increasing demand.

Within the district to be irrigated from the company's canals, and covered by the vendor company's franchise, over 48,000 acres of valley lands have already been brought under ditch. At \$1.50 (6s.) per acre per annum (the minimum rate) these lands alone will give an income of £15,000 per annum.

After the completion of the dam, weirs, and main canal the company does not intend selling water rights under £10 per acre, and water rents, under water rights, sold after the 1st day of January, 1897, will, in all probability, be raised to not less than 10s. per acre per annum. Under the Sweetwater irrigation system (California), the annual water rent is \$3.50 (14s.) per acre, and lands with water rights are sold for £40 per acre more than lands without water rights. (Vide Californian State engineer's official report.)

When the whole of the proposed irrigation works are carried out, over 230,000 acres of valley lands and about 300,000 acres of mesa lands will be under ditch. Say 50,000 acres pay an annual water rent of \$1.50 (6s.) per acre, and the remainder \$2.50 (10s.) per acre, and allowing that

two thirds only of the above acreage be irrigated in any one year, 66 the company will derive an annual income from water rents alone of £175,000.

An average of £10 per acre for water rights will give the company from the sale of water rights to, say, 300,000 acres, £3,000,000. The net return per acre will in all probability be much higher, as many land owners are at present unable to pay cash and are giving one-half their lands for water rights to the other half. These lands should be readily saleable at from £20 to £50 per acre as soon as under ditch.

The whole of the irrigation works of the company are, by law, exempt from taxation for six years.

The property and enterprise and the cost of building the canals and a solid masonry (stone and concrete) dam have been exhaustively investigated and reported upon by the company's engineer, a thoroughly competent authority in irrigation and hydraulic matters.

The engineer's estimates for construction (allowing for contingencies, see report) are as follows: Main dam at Elephant Butte, £52,398 19s. 2d.; dam No. 2 (weir, ditch head), £5,807 1s. 8d.; dam No. 4 (ditch head), £4,095 6s. 3d.; distributary canals for irrigation from main dam to lower end of Mesilla Valley (see map), £73,605 4s. 2d.

Tenders have been received by the vendor company from reliable and well-known contractors, which show that the main portion of the works (the portion tendered for) can be executed according to specification at a price well within the engineer's estimate.

The statements herein are based upon reports made by Colonel Anson Mills, United States Army (who was specially deputed by the United States Government to study the project of damming the Rio Grande), Major J. W. Powell, late Director of the United States (Government)

Geological Survey; John F. Wielandy (late secretary Missouri State Board of Agriculture); Professor Hiram Hadley, A. M., president of the (Government) College of Agriculture, Las Cruces, Rio Grande Valley, New Mexico; John L. Campbell, C. E.; E. V. Berrien, esq., and others.

The price to be paid to the vendor company for its franchise, property, rights, privileges, land and water contracts, &c., has been fixed at £326,500, payable £26,500 in cash and £300,000 in fully paid-up ordinary shares (out of which the vendor invests £5,000 in consols for payment of interests on debentures during construction). The vendor company will also be paid the premiums received on the present issue of debentures. The vendor company will pay all the expenses of the formation and promotion of the company up to the first general allotment and reserves the right to subscribe for any portion of the share capital for the time being not subscribed at a premium of $\frac{1}{8}$ th per share.

67 The only contract to which the company is a party is between the vendor company of the one part and the company of the other part, and dated the 12th day of February, 1896, relative to the acquirement of the vendor company's rights and undertaking. The vendor company has entered into contracts and arrangements to which the company is not a party in respect of the formation of the company and the guaranteeing of a portion of its capital, which may be contracts within the meaning of section 38 of the companies' act, 1867, and applications for shares will be received only on the understanding that the applicants waive the specification of the dates of, and the names of the parties to, such contracts and arrangements, and waive any further compliance with the said section other than herein contained.

Applications for debentures and shares must be made on the accompanying forms, and lodged with the amount payable on application with the company's bankers.

If no allotment is made the deposit will be returned in full, and should the number of debentures or shares allotted be less than the number applied for the surplus will be credited in reduction of the amount payable on allotment.

The debentures may (with interest to date) be exchanged at any time at £55 each for lands with water rights (if any remain unsold) belonging to the company, at the price at which its lands with water rights are then offered for sale.

The memorandum and articles of association of the company, the contract above referred to, and a copy of the debenture form and trust deed, etc., may be seen on application to the solicitors of the company, 24 Coleman street, E. C., and the reports, maps, plans, &c., may be seen on application at the office of the company, 34 Victoria street, Westminster, S. W.

MEMORANDUM OF ASSOCIATION OF THE RIO GRANDE IRRIGATION AND LAND COMPANY, LIMITED.

1. The name of the company is "The Rio Grande Irrigation and Land Company, Limited."
2. The registered office of the company will be situate in England.

3. The objects for which the company is established are:

(i) To purchase, lease, obtain concessions of, or otherwise acquire lands and hereditaments of any tenure, or to obtain any interest in any lands or hereditaments in the Territory (or State) of New Mexico, United States of America, or elsewhere; and to work, manage, and develop the same in such manner as the company shall think fit, and in particular to build dams, weirs, canals, sluices, acequias, ditches, culverts, filter beds, pipes, aqueducts, and other irrigation works, either for irrigation or other purposes, and to execute and do all other works necessary or convenient for obtaining, storing, impounding, selling, delivering, distributing, and measuring water for irrigating the lands of the company, or for the sale and distribution of water to owners or occupiers of lands not belonging

68 to the company, and for the sale of water rights, and for carrying on the business of an irrigation and waterworks company in all its branches. To erect, improve, and maintain piers, warehouses, factories, foundries, wharves, dwelling houses, and such other premises, buildings, mills, machinery and plant, and to construct such roads, railways, tramways, waterworks, reservoirs, telegraph, water, gas, electric, and power supply works, shops, stores, drainage, sanitary, and other works and conveniences as may seem calculated, directly or indirectly, to advance the company's interests.

(ii) To supply water to cities and towns, and others for irrigation, domestic and municipal purposes, and for milling and mechanical power. To irrigate, colonize, cultivate, improve, develop, and otherwise turn to account, the resources of any lands, estates, or other properties that may be acquired by the company, and for such purpose to purchase such horses, mules, cattle, stock, and implements as may be necessary for cultivating, clearing, planting, farming, and pasturing the lands of the company, and from time to time to sell all or any part of the live or dead stock, and the produce of the said lands. To carry on the business of general merchants, manufacturers, planters, farmers, and cultivators of the soil in all its branches. To grow trees and vines, and deal in agricultural produce and timber. To grow, purchase, or sell grapes, oranges, lemons, and other fruits, and to manufacture, purchase, or sell wines, spirits, barrels, casks, jars, bottles, and other vessels. To erect and carry on fruit and vegetable canning, drying and evaporating works in all their branches. Also to carry on the business of breeding, importing, and exporting sheep, cattle, and horses, or any other business, trade, or undertaking, the carrying on of which may be deemed by the company conducive to the development of its property, or interest therein. To do all acts conducive to promote the colonization and settlement of the lands of the company, and in particular by the establishment of towns, villages, and settlements, and the erection of schools, churches, hotels, and such other institutions as may be calculated directly or indirectly to improve or advance the prosperity of the settlers on the lands of the company.

(iii) To advance and lend money to settlers, colonists, and others, with or without security, and generally to transact all kinds of banking and general agency business in respect of agricultural, commercial, mining, or financial matters, and to guarantee the performance of contracts by customers of, and persons having dealings with, the company.

(iv) To amalgamate, unite, or cooperate with any other company or

association now or hereafter to be established for or engaged in or having objects or undertakings similar or analogous to those of this company.

69 To make or carry into effect working or other agreements with any other company, authority, firm, or individuals, for sharing in profits, for their cooperation in or for the establishment and for the attainment of any of the objects herein, and also to acquire or participate in, by taking shares or otherwise, the good will, property, and assets of any company established for any of the purposes herein mentioned, also to promote or establish any company for the purpose of acquiring the whole or any part of the property of this company, or for carrying on its business.

(v.) To purchase for investment or resale and generally to traffic in land and house and other property of any tenure, and any interest therein, and to create, sell, and deal in freehold and leasehold ground rents, and to make advances upon the security of land, fruit farms, and vineyards, or house or other property, or any interest therein, and generally to deal in, and traffic, by way of sale, lease, exchange, or otherwise, with land and house property, and any other property, whether real or personal.

(vi.) To buy, sell, import, export, manipulate, prepare for market, and deal in merchandise of all kinds, and generally to carry on business as merchants, importers, and exporters.

(vii.) To borrow, raise, or secure the payment of money in such manner and on such terms as may seem expedient, and in particular by debentures, debenture stock, or mortgages, whether perpetual or redeemable, at a premium or otherwise, and charged or not charged upon the whole or any part of the property of the company, both present and future, including its uncalled capital.

(viii.) To draw, accept, endorse, and make, discount, execute, use, and issue, promissory notes, bills of exchange, bills of lading, warrants, debentures, debenture bonds, and other negotiable or transferable instruments.

(ix.) To apply to the government or legislature of the Territory (or State) of New Mexico, State of Texas, Mexican State of Chihuahua, or to the Federal authorities of the United States of America, or Republic of Mexico, or to any other authority, for any charters, grants, concessions, irrigating, mining, or other privileges, or authorities for the better enabling the company to carry out the objects of the company.

(x.) To enter into any arrangements with any government or authorities, whether supreme, municipal, local, or otherwise, that may seem conducive to the business or objects of the company, and to carry out and comply with any such arrangements.

(xi.) To sell, lease, exchange, or otherwise deal with or dispose of the whole or any part of the undertaking, rights, or privileges, or the lands and hereditaments, plant, machinery, and buildings of the company, or any interest therein, for such consideration as the company may think fit, and, in particular, for shares, debentures, or securities of any other company, having objects altogether or in part similar to those of
70 this company, or carrying on any business which this company is authorized to carry on.

(xii.) To distribute among its members in kind or in specie any property of the company, or any proceeds of sale or disposal of any property

of the company, but so that no distribution, amounting to a reduction of capital, be made, except with the sanction (if any) for the time being required by law.

(xiii.) To tender for, purchase, or acquire from liquidators, trustees, or other persons, the assets or estates of any insolvent or other corporations, companies, associations, firms, or persons, and for the purposes of giving effect to and realizing the benefit of any such acquisition, to carry on and conduct any business comprised in any such estate or assets, whether such business is or is not expressly included among the objects of the company as defined by this memorandum of association.

(xiv.) To remunerate by way of allowance of brokerage or commission, or in any other manner, any person or persons for services rendered, or to be rendered, or for assisting to place any shares of the company's capital, or any debentures, debenture stock, or other securities of the company, including all commissions or other remuneration to brokers and other persons, for procuring or obtaining settlements and quotations upon London or provincial, or foreign exchanges, of the said share or debenture capital, or of the share or debenture capital of any business undertaken by the company, and to make donations to such persons, either of cash or other assets, as the directors of the company may determine to be directly or indirectly conducive to any of the objects of the company, or otherwise expedient.

(xv.) To obtain any provisional order, license, authorization, or act of Parliament, or other legislative authority, for enabling the company to carry any of its objects into effect, or for effecting any modification of the company's constitution, and to oppose any applications to Parliament or any other legislative authorities which may seem calculated directly or indirectly to be prejudicial to the interest of the company.

(xvi.) To make all deposits of money or securities and do all things necessary for the compliance with the laws and regulations of any government in any place where the business of the company may for the time being be carried on, and for such purpose, if necessary, to conduct its business through any subsidiary company, and to do all acts necessary to procure the company to be duly constituted according to the laws of any State or Territory in the United States of America or Republic of Mexico.

(xvii.) To invest and deal with the moneys of the company upon such security and in such manner as the directors of the company may from time to time think fit.

71 (xviii.) To issue any shares of the company at such times, and in such manner, and either at par or at a premium, or as fully, or in part paid up, and generally upon such terms and conditions in every respect as the board of the company shall deem expedient.

(xix.) To support or subscribe to any charitable or public body or works, and to give pensions, gratuities, donations, and emoluments to any persons employed by or rendering service to the company.

(xx.) To exercise the powers given by the companies' act, 1864, in any case in which the company, or the board thereof, shall deem it necessary so to do, for the purpose of more properly or effectually carrying on the business of the company.

(xxi.) To do all or any of the above things either as principals,

agents, contractors, trustees, or otherwise, and by or through trustees, agents or otherwise, and either alone or in conjunction with others.

(xxii) To alter this memorandum of association in such particular as may be deemed to be desirable, and to make by-laws, rules, and regulations for the management of the company or otherwise.

(xxiii) To do all such other things as may be incidental or conducive to the attainment of all or any of the above objects.

4. The liability of the members is limited.

5. The capital of the company is £500,000, divided into 100,000 cumulative preference shares of £1 each, to be numbered 8 to 100007, inclusive, and 400,000 ordinary shares of £1 each, with power to increase. Any shares of the original capital and any new shares from time to time to be created may (but subject always and without prejudice to the rights of the holders of the original preference shares) from time to time be issued with any such guarantee or any such right of preference, whether in respect of dividend or repayment of capital, or both or any such other special privilege or advantage over any shares previously issued, or then about to be issued, or at such a premium, or with such deferred rights as compared with any shares previously issued, or then about to be issued, or subject to any such conditions or provisions, as the company may from time to time by special resolution determine. But no such issue shall be made without the consent in writing of the holders, for the time being, of at least three-fourths of any previous issue of shares which will be thereby affected.

6. Before payment of any dividend on, or making any distribution of profits in respect of the ordinary shares, there shall be set aside out of the net profits of the company such sum or sums as the directors from time to time in their absolute discretion think proper, as a reserve fund to meet contingencies, or for equalizing dividends, or for providing for the redemption of the debentures of the company (if any), or for repairing or maintaining any property of the company, or for such other purposes as the directors shall think conducive to the interests of the company. Such fund shall be applied for the purposes for which the same shall have been set aside, as and when the directors shall determine. Subject thereto such fund shall belong:

(a) To such preference shares as may, for the time being, be preferential as to dividends and capital to the extent of the dividends, if any, unpaid and to the extent of the amount per share, for the time being paid up on such preference shares.

(b) To the ordinary shares and others, if any, to the extent of the amount per share paid up on such shares. If any surplus the original preference shares and ordinary shares (except as may hereafter be provided with the sanction of an extraordinary resolution as defined by section 129 of the "companies act," 1862, passed at separate general meetings of the members of each class) shall rank *pari passu* share for share.

7. The net annual profits of the company, after the deductions aforesaid, as provided for by clause 6 hereof, shall be applied and dealt with as follows:

(a) There shall first be paid thereout any dividend which, under the terms of the issue of any shares, as provided in clause 5 hereof, may be

payable in priority to the dividends payable on any other shares of the company.

(b) Subject to such sums (if any) as may be payable under the above subsection there shall be paid out of the net profits in each year to the holders of the original cumulative preference shares of the company a dividend at the rate of 8 per cent per annum on the amounts for the time being paid up thereon. But should the net profits in any one year be insufficient, after providing for a reserve fund as specified in clause 6 hereof, to pay on the said original cumulative preference shares a dividend at the said rate of 8 per cent per annum, the directors shall pay on the said shares such a dividend as the net profits in that year will provide, any deficiency in the dividend of the preceding year or years to become payable and be paid out of the profits of the next and subsequent years.

(c) Subject to subsections (a) and (b) of this clause, the net profits in each year, after paying in full a dividend at the rate of 8 per cent per annum on the amounts for the time being paid up on the original cumulative preference shares, and after paying a dividend of 8 per cent per annum on the amounts for the time being paid up on the ordinary shares, shall become divisible pro rata among the holders of the original cumulative preference shares and the holders of the ordinary shares, and on becoming divisible, shall be so divided among them according to the amount of shares held by them and in proportion to the amounts for the time being paid up thereon.

73 (Endorsement:) Issue of £100,000 in 8 per cent cumulative preference shares, £100,000 in ordinary shares, and £50,000 in 5 per cent first-mortgage debentures. The Rio Grande Irrigation and Land Company, Limited. Capital, £500,000. Prospectus.

In the district court of the third judicial district of New Mexico for the trial of causes arising under the laws of the United States.

Joint and several pleas and answer of the Rio Grande Dam & Irrigation Company and the Rio Grande Irrigation and Land Company, Limited, to the bill of complaint of the United States of America.

To the honorable Gideon D. Bantz, associate justice of the supreme court of the Territory of New Mexico, and judge of the third judicial district courts thereof :

PLEA.

These defendants by protestation, not confessing or acknowledging the matters and things in and by said bill set forth and alleged to be true, in such manner and form, as the same are thereby and therein set forth and alleged, for plea paragraph eight of said bill, and to so much of said bill as alleges a ground for the relief sought, that the proposed construction of the dam and reservoir of defendants at Elephant Butte, New Mexico, has never been affirmatively authorized by law, and that such can not lawfully be made until the plans of same have been submitted to and approved by the Secretary of War; and to the prayer of relief based on such and similar allegations these defendants say :

That the site of its proposed construction of the said dam and reservoir at Elephant Butte, in the Territory of New Mexico, and of all and singular its proposed construction of dam and reservoirs is and are in the Territory of New Mexico, and within the arid region of the United States.

And defendants further say, that by the acts of the Congress of the United States, of October 2nd, 1888, and August 30th, 1890, and subsequent similar legislation, it is provided by law, among other things, for the survey and segregation of lands for reservoir sites in the said arid region by the officers of the Geological Survey and the honorable Secretary of the Interior; that under said acts of Congress and the rules and regulations adopted thereunder no restriction whatsoever is or has been placed or named as to the stream or streams, whether navigable or nonnavigable, upon which such reservoir sites might be and have been surveyed and segregated; that under said acts of Congress the Rio Grande River in the Territory of New Mexico from the northern boundary of said Territory to its southern boundary has been surveyed under the direction of the Secretary of the Interior and a large number of reservoir sites selected thereon and upon the tributaries thereof; that divers such reservoir sites so surveyed and selected, and among others reservoir sites numbers thirty-eight and thirty-nine, have been approved and reserved by the Secretary of the Interior, acting in accordance with the laws of the United States; that the said reservoir site number thirty-eight, within the Territory of New Mexico, is situated a short distance above Elephant Butte, in Sierra County, New Mexico, and that the said reservoir site number thirty-nine is situated at or near Palomas, in said county and Territory, some distance below said Elephant Butte; that the lands embraced within said reservoir sites last named and other such sites within the Territory of New Mexico have, as aforesaid, been segregated and reserved by the honorable Secretary of the Interior, the said sites numbers thirty-eight and thirty-nine upon November 14th, 1891; that such reservation and segregation of all such sites, including sites numbers thirty-eight and thirty-nine, have been recognized and affirmed by various acts of Congress from August 30th, 1890, down to and including the act of February 26th, 1897, by which said last-mentioned act it is provided that all such sites heretofore and hereafter to be approved should be thrown open to corporate and private entry under the act of March 3rd, 1891; and that such approval of such reservoir sites by the Congress of the United States and such provisions for the entry of the same by private or corporate parties are without any reservations or restrictions whatsoever as to the navigability or nonnavigability of the streams upon which the same are situated; that upon June 18th, 1897, in accordance with the provisions of the act of February 26th of the same year, the defendant, The Rio Grande Dam & Irrigation Company, has made application in the proper manner for the said reservoir sites numbers thirty-eight and thirty-nine, respectively, which said application is now pending.

And for a further plea defendants say that the defendant, the Rio Grande Dam & Irrigation Company, is properly organized and doing business under the laws of the said Territory of New Mexico, and has complied with all the laws of said Territory in reference to the construction of

dams and reservoirs and the diversion of waters of public streams of said Territory, and that having complied with said laws the said defendant is authorized thereunder to construct its dams and reservoirs in the Rio

Grande River in said Territory and divert the waters thereof;

75 and the defendants further say that the said Rio Grande Dam & Irrigation Company having first complied with the local laws, rules, and regulations, made and filed its articles of incorporation and proof of its organization with the Secretary of the Interior, and made its application for its dam and reservoir at Elephant Butte, the construction of which is here sought to be restrained before the land office at Las Cruces, New Mexico, and that such application and the map and survey of such dam and reservoir has a long time prior hereto and prior to the filing of the bill of complaint herein been approved by the Secretary of the Interior of the United States, and is yet so approved, and the construction of said dam and reservoir duly authorized under the provisions of an act of Congress of March 3rd, 1891, under which said act application for such right to construct such dam and reservoir was duly made as aforesaid.

And defendants ask that the various reports of the Geological Survey of the United States and of the Secretary of the Interior, showing such surveys of the Rio Grande River, together with the maps of the various reservoirs and land segregated under authority of law, as well as a certified copy of the map of the survey of the Elephant Butte reservoir, duly approved under the authority of Congress by the honorable Secretary of the Interior and herewith offered in evidence, may be made a part of this plea.

All of which matters and things these defendants do aver to be true, and that pleading said statutes, and under said statutes and the acts of the honorable Secretary of the Interior in bar to the plaintiff's bill, or to so much thereof as hereinbefore particularly mentioned, and pray judgment of this honorable court whether they should be compelled to make any other or further answer to said bill, or to so much thereof as is hereinbefore pleaded to, and pray to be hence dismissed with their costs and charges in that behalf most wrongfully sustained.

W. A. HAWKINS,
S. B. NEWCOMB,

ALBERT B. FALL,
Counsel for Dfs.

TERRITORY OF NEW MEXICO,

County of Grant, ss:

Wilfred T. Johns, being duly sworn, on his oath says: That he is the secretary of the Rio Grande Dam & Irrigation Company and the resident secretary of the Rio Grande Irrigation and Land Company, Limited; that he has read the foregoing plea, and that the same is true in every particular in point of fact and that the same is not interposed for delay.

W. T. JOHNS.

Subscribed and sworn to before me this twenty-sixth day of June, A. D. eighteen hundred and ninety-seven.

[SEAL.]

J. F. POSEY, *Notary Public.*

We hereby certify that in our opinion the above plea is well founded in point of law.

A. B. FALL,
S. B. NEWCOMB,
W. A. HAWKINS,
Counsel for Defendants.

UNITED STATES OF AMERICA,
Territory of New Mexico:

In the district court of the third judicial district of the Territory of New Mexico, for the trial of causes arising under the laws of the United States.

The joint and separate answer of the Rio Grande Dam & Irrigation Company and the Rio Grande Irrigation and Land Company, Limited, to the amended bill of complaint of the United States of America, filed by the Attorney-General of the United States and the United States attorney for the Territory of New Mexico in the above-styled court.

These defendants, now and at all times hereafter saying to themselves all and all manner of benefit or advantage of exception or otherwise that can or may be had or taken to the many errors, uncertainties, and imperfections in the said bill contained, for answer thereto or to so much thereof as these defendants are advised it is material or necessary for them to make answer to, answering, say:

1st. They admit that The Rio Grande Dam & Irrigation Company is a corporation duly organized under and in pursuance of the laws of the Territory of New Mexico, having its principal place of business in the town of Las Cruces, county of Doña Ana, in said Territory, and has for its purposes and objects the construction and maintenance of dams, reservoirs, ditches, canals, and pipe lines, as stated in said bill of complaint, and that in pursuance of its purposes of incorporation it has given out that it is about to construct dams across the Rio Grande in the Territory of New Mexico, such as may be necessary to carry out the objects and purposes of its incorporation, and that it proposes to accumulate and impound water in such reservoirs, and distribute the same through said canals, ditches, and pipe lines, and that the Rio Grande Irrigation and Land Company, Limited, is a corporation organized under and by virtue of the laws of Great Britain and having its principal office in the city of London, England.

2nd. These defendants admit that the original defendant, The Rio Grande Dam & Irrigation Company, has entered into a contract and agreement for a conveyance to its codefendant of some of its rights in and to its said dams, reservoirs, canals, ditches, and pipe lines, to be constructed as charged in the bill of complaint herein, and that said defendant, The Rio Grande Irrigation and Land Company, Limited, has claimed and is claiming the right to exercise all of the privileges and rights by it secured by virtue of said contract, as aforesaid, but in so far as that portion of said bill is concerned, which charges that the Rio Grande Irrigation and Land Company, Limited, is seeking to obtain control of the entire flow of said Rio Grande, and to divert and use the same, these defendants state, that the entire flow of the Rio Grande during the irrigation season at the point or points where

these defendants are seeking to construct reservoirs upon the same, has long since been diverted and is now owned and beneficially used by parties other than these defendants, in which diversion and appropriation of said waters these defendants have no property rights and that neither one of the defendants are seeking or have ever sought to appropriate or divert by means of structures above referred to, or contemplated diversion by means thereof of any of the waters of said Rio Grande usually flowing in the bed thereof, during the time when the same are usually put to beneficial use by those who have heretofore diverted the same, but on the contrary these defendants state that it has been their intention and their sole intention by means of the structures which they contemplate and which are complained of in said bill, to store, control, divert, and use only such of the waters of said stream as are not legally diverted, appropriated, used, and owned by others and that these defendants have contemplated and now contemplate that any beneficial rights by them acquired in such stream by virtue of such structures will be very largely only so acquired to the excess, storm and flood waters thereof now unappropriated, useless, and which go to waste.

3rd. These defendants deny the statement that the Rio Grande receives no addition to its volume of water between Elephant Butte, at which place defendants admit they propose to erect a dam, and the mouth of the Conchos River as alleged in said bill of complaint, and deny that the character of the soil and the quality of the atmosphere is such in the section of the country through which said river flows, that the impounding of such waters, either by means of evaporation or other causes, or its distribution over the surface of the earth would prevent any material part of such water from returning to said river bed.

4th. These defendants deny that the said Rio Grande is navigable or has been navigated by steamboats up to the town of Roma, in the State of Texas, as is alleged in the complainant's bill, or that the same is susceptible of navigation or has been navigated above said town of Roma or any point whatever, and deny that said river is susceptible of navigation from the point of rapids mentioned in said complainant's bill above said town of Roma to La Jolla, in the Territory of New Mexico, and deny that said river has at any times in the past been used beneficially for the purpose of floating or transporting rafts, logs, or poles, or that any portion of said stream in said Territory of New Mexico is susceptible of being used and navigated for commercial purposes, and deny that the said river is navigable or susceptible of being navigated for the purpose of carrying on commerce between the Territory of New Mexico and the State of Texas and the Republic of Mexico.

5th. These defendants deny that the impounding of the water of said river by the construction of its said dam and reservoir at Elephant Butte or by any contemplated diversion by it of said waters for the uses above indicated will so deplete and prevent the flow of the water through the channel of said river below said dam as to seriously obstruct the navigability of said river at any point below said dam.

Defendants deny that they are proposing to construct said dam without the authorization of law, but on the other hand state and assert that they have full, complete, and lawful authority to construct the same as it so proposes.

THE U. S. VS. RIO GRANDE DAM AND IRRIGATION CO. ET AL.

6th. These defendants deny that the navigability of said Rio Grande at the city of El Paso and State of Texas has been recognized and acknowledged by the Congress of the United States and the Secretary of War of the United States.

7. And these defendants, further answering, deny that by treaty or treaty stipulations between the Government of the United States and the Government of Mexico, it has ever been agreed and declared that neither country shall, without the consent of the other, construct any work that may or might impede or interrupt in whole or in part, the exercise of said right of free navigation, above the southern boundary line of New Mexico, that is to say, above the parallel of 31 degrees 47 minutes 30 seconds north latitude; and defendants aver that by the treaty stipulations between the said Governments it was agreed distinctly that each Government should have absolute sovereignty over the said Rio Grande within its boundaries;

And the defendants further deny that neither of the Governments have consented to or authorized the construction of its dam at Elephant Butte, but allege on the contrary that the Government of the United States has consented to and authorized such construction as it has a right to do within its territorial limits.

And now having fully answered each and every allegation in said bill contained, which the defendant is advised it is necessary and material that it should make answer to, the defendants pray to be hence dismissed with their reasonable costs and charges in this behalf most wrongfully sustained.

W. A. HAWKINS,
S. B. NEWCOMB,
ALBERT B. FALL,
Counsel for defendants.

TERRITORY OF NEW MEXICO,
County of Grant, ss:

Wilfred T. Johns, being duly sworn, upon his oath, says: That he is the secretary of the Rio Grande Dam & Irrigation Company, and the resident secretary of the Rio Grande Irrigation and Land Company, Limited, defendants in the foregoing answer; that he has heard read the said answer, and knows the contents thereof; that the same and each and every allegation therein contained are true, of his own knowledge, except that he has no personal knowledge of the navigability of the Rio Grande below the town of Roma, in the State of Texas, but that through official data, public maps, and statements of witnesses, some of which were sworn to by said parties, he is informed and believes that the Rio Grande below the said town of Roma, out to the Gulf, is not capable of any beneficial use for the purposes of navigation.

W. T. JOHNS.

Subscribed and sworn to before me this twenty-fifth day of June, A. D. eighteen hundred and ninety-seven.

J. F. POSEY, *Notary Public.*

[SEAL.]

In the district court of the third judicial district for the trial of causes arising under the laws of the United States in the Territory of New Mexico, June 25th, 1897.

THE UNITED STATES
vs.
THE RIO GRANDE DAM CO. ET AL. } No. 140. Vacation.

Come now the defendants in above-entitled cause, by W. A. Hawkins, S. B. Newcomb, and Albert B. Fall, their solicitors, and in answer to the rule to show cause heretofore issued, herein file their joint and several plea and answer to the original and amended bill of complaint, and upon the coming in and consideration of the same and the several affidavits filed, together with the correspondence and volumes of the 10th, 11th, 12th, and 14th Annual Reports of the Secretary of Interior, part Irrigation, and vol. 3 and 4, Report of the Senate Committee on Arid Lands, and Report on Irrigation, 1893, Secretary of Agriculture, and report of Secretary of War to 51st Congress, with the maps of arid lands, etc. Move this honorable court here to discharge said rule and to dissolve the injunction heretofore granted herein, and to dismiss the original and amended bills of complaint.

W. A. HAWKINS,
S. B. NEWCOMB,
ALBERT B. FALL,
Counsel for Defts.

In the United States district court of the third judicial district of the Territory of New Mexico.

UNITED STATES OF AMERICA
vs.
THE RIO GRANDE DAM & IRRIGATION } No. 140.
Company et al.

Replication of the United States of America, complainant, to the joint and several answer of defendants in the above-entitled cause.

This repliant, saying and reserving to himself all and all manner of advantage of exception to the manifold insufficiencies of the said answer, for replication thereunto saith that they will aver and prove their
80 said bill to be true, certain, and sufficient in the law to be answered unto; and that the said answer of the said defendant is uncertain, untrue, and insufficient to be replied unto by this repliant; without this, that any other matter or thing whatsoever in the said answer contained, material or effectual in the law to be replied unto, confessed, and avoided, traversed or denied, is true; all which matters and things this repliant is and will be ready to aver and prove as this honorable court shall direct; and humbly prays as in and by their said bill they have already prayed.

W. B. CHILDERS,
United States Attorney for New Mexico.

In the United States district court of the third judicial district of the Territory of New Mexico.

THE UNITED STATES OF AMERICA
vs.

THE RIO GRANDE DAM & IRRIGATION CO. ET AL. } No. 140.

Comes now plaintiff in the above-entitled cause and moves the court to set down the joint and several pleas as filed in said cause by the defendants therein, for argument as to their sufficiency as a defense to said suit, as a matter of law.

W. B. CHILDERS,
U. S. Attorney for New Mexico.

In the district court of the third judicial district of the Territory of New Mexico.

UNITED STATES OF AMERICA, COMPLAINANT,
vs.

THE RIO GRANDE DAM & IRRIGATION COM- } No. .
pany et al., defendants.

Affidavit of Anson Mills, brigadier-general, United States Army, Boundary Commissioner.

STATE OF TEXAS, County of El Paso, ss:

ANSON MILLS, of lawful age, being duly sworn, upon oath deposes and says that he is a brigadier-general in the United States Army, and has been for the past four years on special duty as Mexican boundary commissioner, having in addition to that duty in charge, together with the Mexican commissioner, the study of a feasible project for the equitable distribution of the waters of the Rio Grande to all persons residing on its banks or tributaries, having equitable interest therein, that for several years in the past—nearly forty years ago—he resided in El Paso, Texas, and was engaged as an engineer and surveyor in this vicinity, surveying lands in Texas abutting on the Rio Grande; that eight years ago he was for twelve months engaged in the preliminary investigation, by order of the Department of the Interior, for an international dam projected near this city; that for these reasons, and a general study of the regimen of the Rio Grande, he states with greater confidence than he otherwise would, his knowledge of the questions submitted to the United States district court in the third judicial district of the Territory of New Mexico, in an amended bill prepared by United States Attorney Childers, which he has read and is familiar with.

Affiant states that from his own personal knowledge the Rio Grande is now navigated by steam from Brownsville, Texas, to Camargo, Tamaulipas, opposite Rio Grande City, Texas, a distance of about two hundred and fifty miles by the river's course, and from information and belief he states it to have been in former years navigated by steam as far as Roma, a distance of about three hundred miles by the river's course from Brownsville, Texas. The latter information was obtained from

Maj. W. H. Emory's (United States boundary commissioner) official report of his survey of the boundary line in 1852 to 1855, and from the verbal statements of Captain Kelly, of Brownsville, Texas, who has been in the steamboat business for over thirty years, and who stated to affiant that at the time of the Maximilian war he had thirty steamboats in his service, operating between Brownsville, Texas, and Camargo, Tamaulipas, and that at the same period the United States Government had many additional vessels engaged in the same business, as well as several gunboats plying on the river, but at this date his fleet has been reduced to one small vessel, the "Steamer Bessie," and that said Captain Kelly informed him by reason of the depletion of the depth of the channel of the Rio Grande, that it was now very difficult for him to navigate this one small vessel with very light draft.

And affiant further states that from information and belief, that the river has been navigated by sailboats, flatboats, and small boats above Roma, Texas, to a point about one hundred and fifty miles below Presidio del Norte, Texas. That he obtained this information from the aforesaid Major Emory's report, wherein it is stated that he procured a number of small boats built in San Antonio, Texas, and carried them to a point about one hundred miles above the mouth of Devil's River, and that his engineers used them for taking the topography of the country and surveying the boundary line; and from a report of Captain Love, in the employ of the Quartermaster's Department of the United States Army, who claims to have carried a small boat up the river to within one hundred and fifty miles below El Paso, Texas, but affiant believes that he was mistaken in the point described, as in those days El Paso was known as El Paso del Norte, and Presidio as Presidio del Norte, and affiant is of the opinion that he had Presidio del Norte in view in his report instead of El Paso del Norte, as written. Affiant further states that in 1858 he, with a party, constructed and floated a raft of logs from a point known as El Canutillo, above El Paso, Texas, down to El Paso, for building purposes, and that he is informed and believes that the same has
82 been done by many other parties about that time, the names of whom he is now unable to remember; and that recently a party constructing the Postal Telegraph Company's line used the river's current for floating their telegraph poles down the river at a point near La Joya, New Mexico.

Affiant further states that in past years, namely forty years ago, there was comparatively an abundance of water in the river, and that it seldom went dry (about only once in seven years) and then for a very short period, generally about the month of August or September. That in later years the waters have been much depleted during the summer and fall, but the flood waters of the spring are still great and last from one to two months, during which period they are susceptible of carrying small boats, flatboats, rafts, and logs. At times, periodically each year, the volume of water is so great that steamboats could navigate it for hundreds of miles both above and below El Paso, Texas.

Affiant further states that he has been engaged, under the Geological Survey, in taking the flow of the river for a full year at El Paso, Texas, and has had access to the gaugings of the flow of the Rio Grande for many years both there and at Embudo and Rio Grande, in the Territory of New Mexico.

Affiant further states that there are no tributaries of the river of any importance below Embudo to El Paso, or for two hundred miles below El Paso to the mouth of the Conchos River. That while engaged in gauging the flow of the river, he was also engaged in observing the evaporation and discovered that the evaporation was over six feet from the surface per annum at El Paso, Texas, and as the region is arid for two hundred miles above and below El Paso, it is presumed that the evaporation would be about the same for that distance, and that the impounding of a large quantity of the flow of the river in a lake as proposed would, in his opinion, largely increase the ordinary evaporation of the waters, as would also the distribution of the waters through numerous canals and ditches, as proposed, through the arid soil, and in addition thereto, there would be still a great loss by seepage into the dry and porous earth, a very small portion of which seepage would, in all probability, return to the river, and this opinion is based upon his actual observation and knowledge of the irrigating systems of this country, soil, and climate.

Affiant further states that the Rio Grande receives the greater portion of its waters from its tributaries in Colorado and New Mexico, above Elephant Butte; that its next important tributary is the Conchos River, which empties into the Rio Grande about two hundred miles below El Paso, Texas. That in the past ten years, the numerous ditches and canals taken out of the head waters of the river in Colorado and northern New Mexico, have impaired the navigable capacity of the river continuously below to the Gulf during the summer months, but have not entirely destroyed it. What is stated just above generally, will be shown specifically in detail by an official report of Assistant Engineer W. W. Follett, on his investigations of the upper waters of the Rio Grande in Colorado and New Mexico, dated November 17th, 1896.

Affiant further states that in an official investigation superintended by him of a proposed lake similar to the one proposed, with a dam sixty feet high, it was discovered that the cubic contents of the entire reservoir would be 537,340 acre-feet, and that if full of water the evaporation from the surface for one year would be six and one-half feet off the surface, or 130,000 acre-feet of the total cubic contents of 537,340 acre-feet, just about one-fourth the cubic contents of the lake. The evaporation was measured by actual tests in the most skilled methods now known.

ANSON MILLS.

Subscribed and sworn to before me this the 23rd day of June, A. D. 1897.

[SEAL.]

D. H. HART,

Clerk of U. S. District Court, W. D. T.

By J. P. HODGSON, *Deputy.*

This indenture, made the thirtieth day of May, in the year one thousand eight hundred and ninety-six, between The Rio Grande Dam & Irrigation Company, a corporation organized under and by virtue of the laws of the Territory of New Mexico, and the provisions of an act of the legislative assembly of the said Territory approved February twenty-fourth, one thousand eight hundred and eighty-seven, and to all laws amendatory thereof, party of the first part, and the Rio Grande Irrigation and

Land Company, Limited, a corporation organized under companies acts of the United Kingdom of Great Britain and Ireland, 1862 to 1890, party of the second part:

Whereas the Government of the United States of America did, on the first day of February, one thousand eight hundred and ninety-five, grant unto the party hereto of the first part, certain exclusive rights, privileges, franchises, and concessions to be exercised and enjoyed in the manner and within the area hereinafter set forth, to appropriate the waters of the Rio Grande River, to erect dams, weirs, ditch heads, canals, reservoirs, and all other works in connection with irrigation for public and private purposes, and in connection with the said purposes to locate, establish, and maintain rights of way for the conveyance of water over certain public and private lands mentioned hereinafter, together with the right and privilege to occupy all lands subject to overflow, by reason of the erection of the aforesaid dams and reservoirs, canals, and other irrigation works, and fifty (50) feet on both sides of the said waterways and canals, and the right of taking and using from such lands, such timber, earth, and stone as may be needed in constructing any of the aforesaid works and any works and buildings in connection therewith, and,

84 Whereas the party of the first part has, in consideration of divers valuable considerations, agreed to enter into these presents, now, therefore,

This indenture witnesseth that the said party of the first part, for and in consideration of the rents, covenants, and agreements hereinafter mentioned, reserved, and contained on the part and behalf of the said party of the second part, its successors and assigns, to be paid, kept, and performed, has leased, demised, and to farm, let, and full liberty given to enjoy and exercise, and by these presents does lease, demise, and to farm, let, and full liberty give to enjoy and exercise, unto the said party of the second part, its successors and assigns, all and singular the property of whatsoever nature, and wheresoever situated, of and belonging to the said party of the first part, and all appurtenances thereunto belonging or in anywise appertaining, including all the rights, privileges, franchises, and concessions granted to the said party of the first part, by any and all acts of the Government of the United States of America, or by any and all orders, rules, certificates, patents, decrees, or charters of any and all departments of the said Government of the United States as hereinbefore referred to, and by any and all laws, acts, charters, and authorities of the said Territory of New Mexico authorizing and empowering the said party of the first part to locate, establish, and maintain rights of way for the conveyance of water over public and private lands in the said Territory of New Mexico and elsewhere and to construct and maintain dams, reservoirs, canals, ditches, and pipe lines for the purpose of impounding and supplying water for irrigation, mining, manufacturing, domestic, and other uses to private and public consumers and to towns and cities for municipal and commercial and all other purposes, and to acquire and dispose of lands and other property in connection therewith, and to colonize and improve the said lands,

All of which rights, privileges, franchises, and concessions are to be

enjoyed in the manner, and the lands are situate in the area, more particularly described as follows:

That is to say, the beginning point and terminus of the main line of such canals, ditches, and pipe lines shall be deemed to begin at the dam or dams to be built across the Rio Grande at any point or place or various places within townships thirteen (13) and fourteen (14) and ranges three (3) and four (4) west in Sierra County, New Mexico, and to terminate at any point or place and various and several places in the Territory of New Mexico, State of Texas, and Republic of Mexico to which it may be practical to carry the waters so accumulated, and the

85 general courses and directions of such new canals, pipe lines, and ditches shall be southerly and southeasterly along the Rio Grande and through the Mesilla Valley and the El Paso Valley and into the Republic of Mexico, and southwesterly and easterly to such places as may be practical to extend the said canals, pipe lines, and ditches and convey the water so accumulated, and the lengths thereof shall be from fifty miles to five thousand miles, it being impossible to state the point of beginning, terminus, course, and length of the said canals, ditches, and pipe lines more definitely.

To have and hold the said above-mentioned and described premises with the appurtenances and grants and franchises, unto the said party of the second part, its successors and assigns, from the first day of June, one thousand eight hundred and ninety-six, for and during and until the full end and term of forty-seven years, thence next ensuing and fully to be completed and ended. Yielding and paying therefore unto the said party of the first part, its successors or assigns, yearly and every year during the said term hereby granted, the yearly rent and sum of one dollar, lawful money of the United States of America, when demanded. Provided, always, nevertheless, that if the yearly rent above reserved, when demanded, or any part thereof, shall be behind or unpaid on any day of payment, whereon the same ought to be paid as aforesaid, or if default shall be made in any of the covenants herein contained on the part and behalf of the said party of the second part, its successors and assigns, to be paid, kept, and performed, then and from thenceforth it shall and may be lawful for the said party of the first part, its successors and assigns, into and upon the said demised premises and every part thereof, wholly to reenter and the same to have again, repossess, and enjoy as in its first and former estate, anything hereinbefore contained to the contrary thereof in anywise notwithstanding.

And the said party of the second part, for itself and its successors and assigns, doth covenant and agree to and with the said party of the first part, its successors and assigns, that it shall and will yearly, and every year during the term hereby granted, well and truly pay or cause to be paid unto the said party of the first part, its successors and assigns, the said yearly rent above reserved, when demanded on the days and in the manner limited and prescribed as aforesaid, for the payment thereof without any deduction or delay according to the true intent and meaning of these presents. And the said party of the second part, for itself and its successors and assigns, doth covenant and agree that it shall and will at its own cost and charge bear, pay, and discharge all such present and

future taxes, whether special or general, and all duties and assessments whatsoever as shall or may during the said term hereby granted be levied, charged, or assessed or imposed upon the said described premises or any part thereof, by virtue of any present or future law of the United States of America or of the Territory of New Mexico.

86 And the said party of the second part, its successors and assigns, doth covenant and agree that it shall and will at its own costs, as often as occasion shall require, of which the said party of the second part, its successors and assigns, shall be the sole judge, well and sufficiently repair, support, and maintain and keep in good and substantial repair and condition the property and premises subject to such repair hereby demised, or expressed so to be, and also all other, the erections, works, and buildings which shall at any time during the said term be erected and set up, in or upon the said demised premises and the same in such good and substantial repair and condition, shall and will at the expiration or sooner determination of the said term of forty years, peaceably and quietly surrender and give up unto the said party of the first part, its successors and assigns, the reasonable use and wear thereof in the meantime only excepted.

And the said party of the first part, for itself and its successors and assigns, doth covenant and agree by these presents, that the said party of the second part, its successors and assigns, paying the said yearly rent above reserved and performing the covenants and agreements aforesaid on his or their part shall, and may at all times during the said term hereby granted, peaceably and quietly, have, hold, and enjoy the said demised premises without any let, suit, trouble, or hindrance of or from the said party of the first part, its successors or assigns, or any other person or persons whatsoever.

And the said party of the first part for itself and its successors and assigns, doth covenant and agree by these presents, that in the event that the said party of the first part shall be granted or may acquire or obtain a renewal or extension of the rights, privileges, charters, and franchises, which it now holds and possesses by virtue of certain orders and grants by and from the Government of the United States of America and by virtue of the acts and laws of the legislative of the Territory of New Mexico, then and in that event the said party of the first part will renew and extend to the party of the second part the term of these presents to the full extent and term of such renewal and extension so granted to the party of the first part, less the period of one day, at the same rent and subject to the same covenants and conditions as are herein reserved and contained, and the said party of the first part, for itself and its successors and assigns, doth further covenant and agree with the party of the second part, that it will upon request of the party of the second part and at its expense, convey and assign to the party of the second part absolutely the premises hereby demised.

In witness whereof the parties hereto have caused their respective corporate seals to be hereunto affixed the day and year first above written.

[SEAL.]

87 The corporate seal of the Rio Grande Dam & Irrigation Company was hereunto affixed in the presence of Nathan E. Boyd, as attorney for the Rio Grande Dam & Irrigation Company in fact.

The common seal of the Rio Grande Irrigation and Land Company, Limited, was by the order of the board of directors affixed in the presence of—

[SEAL.]

W. J. ENGLEDEUE,
WINCHILSEA & N.,
Directors.

N. P. ALLISON,
Secretary.

KINGDOM OF GREAT BRITAIN AND IRELAND,
City of London, England, ss:

On the thirtieth day of May, A. D. 1896, before me appeared Nathan E. Boyd, to me personally known, who being by me duly sworn, did say that he is attorney in fact of the Rio Grande Dam & Irrigation Company, and that the seal affixed to the within instrument is the corporate seal of the said corporation, and that the said instrument was signed and sealed in behalf of said corporation by authority of its board of directors, and the said Nathan E. Boyd acknowledged said instrument to be the free act and deed of said corporation.

Also on the same day before me appeared William John Engledue, colonel, retired, in Her Majesty's Royal Engineers, and the Right Honorable Murray Edward Gordon, Earl of Winchilsea and Nottingham, and Nathaniel Paul Allison, to me personally known, who being by me duly sworn, did say that they are, respectively, two of the directors and the secretary of the Rio Grande Irrigation and Land Company, Limited, and that the seal affixed to the said instrument is the corporate seal of said corporation, and that said instrument was signed and sealed in behalf of said corporation by authority of its board of directors, and the said William John Engledue, the Right Honorable Murray Edward Gordon, Earl of Winchilsea and Nottingham, and Nathaniel Paul Allison acknowledged said instrument to be the free act and deed of said corporation.

In witness whereof I have hereunto set my hand and affixed my official seal the day and year in this certificate first above written.

[SEAL.]

PATRICK A. COLLINS,
*Consul-General of the United States of America
at London, England.*

Filed for record in my office this twentieth day of June, A. D. 1896, at 1 o'clock p. m., and duly recorded in Book of Deeds No. 18, pages 120, 121, 122, 123, and 124, Records of Doña Ana County, N. M.

[SEAL.]

H. F. STEPHENSON, *Recorder.*

TERRITORY OF NEW MEXICO,
Sierra County, ss:

This instrument was filed for record on the 26th day of June, A. D. 1896, at 8 o'clock a. m., and duly recorded in Book B, on pages 490 to 494, inclusive, Miscellaneous Records.

[SEAL.]

THOS. C. HALL, *Recorder.*

TERRITORY OF NEW MEXICO,
Sierra County, ss:

I, Thos. C. Hall, probate clerk and ex-officio recorder in and for said county, in the Territory aforesaid, do hereby certify that the foregoing is

a true and correct copy of an instrument as the same appears of record in my office.

In testimony I have hereunto set my hand and official seal at my office in Hillsboro, New Mexico, this 1st day of July, A. D. 1897.

[SEAL.]

THOS. C. HALL,
Probate Clerk and ex officio Recorder.

TERRITORY OF NEW MEXICO,

County of Doña Ana, ss:

We, the undersigned, desiring to form a company pursuant to the laws of the Territory of New Mexico and to the provisions of an act of the legislative assembly of said Territory approved February 24th, 1887, and to all laws amendatory thereof:

Do hereby make, sign, and acknowledge these articles of incorporation, and do hereby set forth and certify as follows:

First. The full name of the incorporators are Edwin C. Roberts, Edward V. Berrien, John L. Campbell, Peter E. Kern, Phoebus Freudenthal, John H. Riley, Solomon Shulz, Albert M. Loomis, and L. Bradford Prince; and the corporate name of such company is the Rio Grande Dam & Irrigation Company.

Second. The purposes for which this company is formed are for the purpose of constructing and maintaining dams, reservoirs, and canals, and ditches and pipe lines for the purpose of supplying water for the purpose of irrigation, mining, manufacturing, domestic, and other public uses, including supply of water for cities and towns, for municipal and commercial uses, and for power and all other useful purposes to which water can be supplied, and for the purpose of colonization and the improvement of lands in connection therewith, and for such other purposes and with such other objects, powers, and privileges as may be permitted or conferred by general or special acts of this Territory, or by the act of Congress of the United States or the Government of Mexico. And it is the purpose of this company to carry on and transact any and all operations pursuant to the purpose and within the powers herein set forth, as well in the Territory of New Mexico and the State of Texas and the Republic of Mexico, and to acquire, mortgage, and dispose of property and transact business in any place or jurisdiction within or without the United States of America. And the beginning point and terminus of the main line of said canals, ditches, and pipe lines shall be to begin at the dam or dams to be built across the Rio

Grande at any point or place or various and several places within township thirteen (13) and fourteen (14) and ranges three (3) and four (4) west, in Sierra County, New Mexico, and to terminate at any point or place and various and several places, in the Territory of New Mexico, State of Texas, and Republic of Mexico, to which it may be practicable to carry the waters so accumulated; and the general courses and directions of such canals, pipe lines, and ditches shall be southerly and southeasterly along the Rio Grande, and through the Mesilla Valley and the El Paso Valley, and into the Republic of Mexico, and southwesterly and easterly to such places as may be practical to extend said canals, pipe lines, and ditches and convey the waters so accumulated, and the length thereof shall be from fifty miles to five thousand miles, it being impossible to state the point of beginning, terminus, course, and length of said canals, ditches, and pipe lines more definitely at this time.

Third. The amount of capital stock shall be five million dollars, to consist of fifty thousand shares of one hundred dollars each.

Fourth. The term of existence of said company shall be fifty years.

Fifth. The number of directors shall be nine, and the names of those who shall manage the business of the company for the first year are: Edwin C. Roberts, Edward V. Berrien, John L. Campbell, Peter E. Kern, Phoebus Freudenthal, John H. Riley, Solomon Schulz, Albert M. Loomis, and L. Bradford Prince, stockholders of said company, and the majority of whom are residents of the United States, and at least one-third of whom are residents of this Territory.

Sixth. The name of the city and county in which the principal place of business of the company is to be located are city of Las Cruces, county of Doña Ana, within the Territory of New Mexico, with offices also in El Paso, Texas, the city of Juarez, Mexico.

In witness whereof, we have hereunto set our hands and seals this twelfth day of January in the year eighteen hundred and ninety-three.

E. V. BERRIEN.	[SEAL.]
EDWIN C. ROBERTS.	[SEAL.]
PHOEBUS FREUDENTHAL.	[SEAL.]
JNO. H. RILEY.	[SEAL.]
J. L. CAMPBELL.	[SEAL.]
A. M. LOOMIS.	[SEAL.]

TERRITORY OF NEW MEXICO,
County of Doña Ana, ss:

On this sixth day of September, eighteen hundred and ninety-three, before me personally appeared Edwin C. Roberts, Edward V. Berrien, John L. Campbell, Phoebus Freudenthal, John H. Riley, Albert M. Loomis, to me known to be the persons described in, and who executed the foregoing articles of incorporation, and severally acknowledged that they made, signed, and executed the same as their free acts and deeds.

In witness whereof, I have hereunto set my hand and notarial seal, at my office in Las Cruces, the day and year last above written.

[SEAL.]

MORRIS FREUDENTHAL,
Notary Public, Doña Ana County, Nuevo Mexico.

90

TERRITORY OF NEW MEXICO,
Office of Secretary, ss:

I have compared the preceding copy of "The Rio Grande Dam & Irrigation Company" with the original thereof on file in this office, and I hereby certify the same to be a correct transcript therefrom and of the whole thereof.

Witness my hand and the seal of the secretary of the Territory, at Santa Fe, the twenty-fifth day of January, one thousand eight hundred and ninety-six.

[SEAL.]

LORION MILLER,
Secretary of New Mexico.

[Public—No. 280.]

An act to authorize the construction and operation of a street railway and wagon bridge across the Rio Grande between the city of El Paso, Texas, and Paso del Norte, Mexico.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the consent of Congress is hereby given to the Santa Fe Street Railway Company, a corporation organized and created under and by virtue of the laws of the State of Texas, to construct, own, maintain, and operate a street railway and wagon bridge across the Rio Grande, between the city of El Paso, in the State of Texas, and Paso del Norte, State of Chihuahua, Mexico, at such point as may be most convenient to said corporation to unite and connect a street railway to be constructed by it in the said city of El Paso with any street railway that may be constructed by any person, persons, or company in said Paso del Norte; and to build and lay on and across said bridge ways for the passage of animals, foot passengers, and vehicles of all kinds, and for the transit of freight, goods, wares, and merchandise, for which said corporation may charge a reasonable toll, which charge shall be subject to revision and regulation from time to time by the Secretary of War.

Sec. 2. That said bridge shall be built of good, substantial material, and of such strength and dimensions as may be sufficient to render the passage of all such vehicles, animals, and persons as are herein mentioned perfectly safe at any and all times.

Sec. 3. That said bridge shall not interfere with the free navigation of said river, and in case of any litigation arising from an obstruction or an alleged obstruction to the free navigation thereof, caused or alleged to be caused by said bridge, the case may be tried before the circuit or district court of the United States for the State in which any portion of said bridge may be situated.

Sec. 4. That equal privileges in the use of said bridge shall be granted to all telegraph companies, and the United States reserves the right for the establishment of a postal telegraph across said bridge.

Sec. 5. That the consent of the State of Chihuahua, United States of Mexico, and of the proper authorities of the Republic of Mexico shall have been obtained before said bridge shall be built or commenced.

91 Sec. 6. That unless the construction of said bridge be commenced within one year and finished within three years from the date of the passage of this act, the provisions of this act shall be null and void.

Sec. 7. That Congress reserves the right to withdraw the authority and power conferred by this act, in case the free navigation of said river shall at any time be substantially or materially obstructed by said bridge, or for any other reason, and to direct the removal or necessary modifications thereof at the cost and expense of the owners of said bridge; and Congress may at any time alter, repeal, or amend this act.

Approved, September 6, 1888.

[Public—No. 183.]

An act to authorize the construction of a street-railway and wagon-road bridge over the Rio Grande River between the city of El Paso, Texas, and Paso del Norte, Mexico.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the El Paso Street Railway Company, a corporation organized and created under and by virtue of the laws of the State of Texas, be, and is hereby, authorized and empowered to construct, own, maintain, and operate a street railway bridge over the Rio Grande River between the city of El Paso, in the State of Texas, and the city of Paso del Norte, in the State of Chihuahua, Mexico, at such point as may be most convenient to said corporation to unite and connect the street railroad to be constructed by them in the said city of El Paso with any street railroad that may be constructed by any person or company in the said city of Paso del Norte, and to build and lay on and across said bridge, ways for the passage of animals, foot passengers, and vehicles of all kinds, for the transit of which said corporation may charge a reasonable toll, which charge shall be subject to revision and regulation by the Secretary of War from time to time.

Sec. 2. That said bridge may be built with unbroken and continuous spans, of the following dimensions, to wit: Six hundred feet in length, twenty feet in width, ten feet in height above high-water level, and with twenty-eight spans, twelve of which to be thirty feet in length and sixteen of which to be fifteen feet in length; that said bridge when completed in the manner herein specified shall be deemed and taken to be a legal structure: Provided, That said bridge shall not interfere with the free navigation of said river; and in case of any litigation arising from an obstruction or alleged obstruction to the free navigation thereof caused or alleged to be caused by said bridge, the case may be tried before the district court of the United States of the State in which any portion of said bridge may be situated: And provided also, That Congress reserves the right to withdraw the authority and power conferred by this act, in case the free navigation of said river shall at any time be substantially

or materially obstructed by said bridge, or for any other reason, and to direct the removal or necessary modifications thereof at the cost and expense of the owners of said bridge; and Congress may at any time alter, repeal, or amend this act. And provided further, That the consent of the Mexican State of Chihuahua, and of the proper authorities of the Republic of Mexico shall have been obtained before said bridge shall be built or commenced.

Approved, July 28, 1882.

TERRITORY OF NEW MEXICO,
County of Grant, ss:

Wilfred T. Johns, being duly sworn, on his oath says: That he is the secretary of the Rio Grande Dam & Irrigation Company and the resident secretary of the Rio Grande Irrigation and Land Company, Limited, the defendants in the injunction suit now pending against them in the

district court of the third judicial district of the Territory of New Mexico, at the instance of the United States.

That previous to last January they had expended a large amount of money in the completion of its surveys and the gathering of the data for the construction of its physical works in the Territory of New Mexico, and that previous to last January it had let its contracts for the construction of a large portion of the same, including a portion of its irrigation canals in Dona Ana County, and also some of its smaller dams and pipe-lines to be used in conjunction with its main Elephant Butte dam and reservoir, and that the work of such construction had progressed so far in the county of Dona Ana aforesaid, that said New Mexico company had laid out and expended in such construction work alone, exclusive of such surveys, the sum of about ninety thousand dollars (\$90,000.00), and all told including surveys up to that time and the salaries of its officials, it had paid out and expended about one hundred and fifty thousand dollars (\$150,000.00).

That such physical work so constructed by it to the value of ninety thousand dollars was so constructed in the bed and along the shores of the Rio Grande; that at the time of the service of the injunction in this case upon said company it had let the contract and was responsible thereunder in addition to the amount so expended by it as aforesaid, for a largely increased amount beyond the same; that its contractor was then engaged in the preparation for such works, and said company had also procured the services of, retained, and then had in their employ and under contract, a large number of skilled and other employees.

That the granting and service of said injunction upon this defendant necessitated the abandonment of a force which had been gathered for the prosecution of such work by the said contractor, and greatly to the damage and injury of said defendants in the delay in the prosecution of its said work, and created wide-spread fear and distrust and dissatisfaction on the part of said company's stockholders, as greatly to injure its financial credit and standing, and threaten its existence as such an enterprise.

93 Affiant further says that to any longer continue the injunction in this cause would force the said defendants to a loss of those works heretofore constructed by them in the way of ditches, canals, and pipe lines, because it would be impossible to preserve those portions already constructed except by using the same in connection with the perfected system of which they will form a part when the same is completed.

Affiant further says that according to the history of the Rio Grande River said defendants have a right to expect that the waters therein will be dry or practically so within a short period, and that then, if unrestrained by injunction, said companies may prosecute said work and complete the same in and along the bed and banks of said river at a great deal less expense than if they are compelled to carry on and effect such works during a season when the river is flushed with water.

W. T. JOHNS.

Subscribed and sworn to before me this twenty-sixth day of June, A. D. eighteen hundred and ninety-seven.

[SEAL]

J. F. POSEY, Notary Public.

TERRITORY OF NEW MEXICO, *County of Grant, ss:*

Henry S. Gillett, being duly sworn, on his oath says: That he is a resident of the county of Grant and Territory of New Mexico; that in 1849, and from that time until some time in 1860 some odd he lived in El Paso, Texas; that he has been intimately acquainted with the Rio Grande River at El Paso, Texas, and at points above there in New Mexico, ever since 1849; that from said date and up to 1862 or '63, when affiant left El Paso, the Rio Grande was practically in all essential features the same character of stream that it is to-day—the same sand banks and sand bars, the same scarcity of water, the same immense floods coming up and going down with great rapidity; that practically during every year while affiant lived at El Paso the said river at said place was dry, and during such seasons affiant frequently and almost every year crossed the dry bed thereof at that place; that during the season when the same was not dry there would be a small volume of water only passing there, possible only two feet deep and from thirty to fifty yards wide; that when affiant first became acquainted with the river its waters were diverted at and near El Paso by an old Mexican, who was farming with the same, and during all the time that affiant remained acquainted with the same there was an old Mexican dam in the same, just above the town of El Paso, which would have absolutely cut off all navigation had it been possible to navigate said river with the amount of water there was in it on an average. Affiant says that said dam had been at such place in said river, so affiant was informed, from the time whereof the memory of man runneth not to the contrary, and affiant is informed that the same is still maintained at said place. Affiant says that said river never 94 was navigable at said town of El Paso, or above or below, within the knowledge of affiant; that it was never used for any purpose by the people except for watering stock and for diverting for agriculture; that affiant has been informed that one Brigadier-General Mills has made an affidavit in this case that back in 1858 he, the said Mills, constructed a raft at Canutillo and floated the same down to El Paso. Affiant says that it is possible that the said Mills did this during a high-water period, but that if so, the logs referred to could have been nothing more than small cottonwood poles, because that was the only kind of timber that ever has been grown near said place of Canutillo; that said place was then and still is familiar to affiant.

Affiant further says that such a case must have been an isolated instance, and affiant knows that such river was not beneficially used for such purposes as a usual thing.

Affiant further says that during the high floods of said river it is impossible to navigate the same with boats, both because of the shifting, changing bed, and the fact that the water spreads out all over the valleys through which it flows, and also because it flows with such terrific force.

Affiant further says that said Rio Grande has no navigable capacity, and is not susceptible of navigation at any point where affiant knows the same.

HENRY S. GILLETT,

Subscribed and sworn to before me this twenty-sixth day of June,
A. D. eighteen hundred and ninety-seven.

[SEAL.]

J. F. POSEY, *Notary Public.*

TERRITORY OF NEW MEXICO,
County of Grant, ss:

A. K. Watts, being duly sworn, on his oath says: That he has known the Rio Grande River in New Mexico ever since 1864, when he was stationed along its course at different places, as United States soldier, and that since said time business and pleasure have often taken him across and along its course; that the same has never been a navigable river, or had any navigable capacity since his acquaintance with it; that his knowledge is so close and thorough of it that he is able to state to the court substantially from the same alone that neither trees, nor rafts, nor boats have ever been floated by the people for pleasure or commerce in New Mexico upon its waters, except that some lone instance may have occurred where for a short distance the same could have been floated, or in some unusual flood some venturesome person may have undertaken to go down the same in a boat; that affiant has heard of such instances, but never heard of one except where the party thus attempting to navigate the stream came to grief; that it is practically now in the same condition that it was when he first became acquainted with it in 1864; has seen the stream go dry in dry seasons, swelling with floods which rapidly rise and fall quickly, changing its banks and course, always treacherous, and of such a character that the community laughs when anyone describes it as navigable.

Affiant further says that even at the highest floods in the stream, because of its treacherous character, of the great fall which it has, that it is incapable of navigation; and further affiant sayeth not.

A. K. WATTS.

Subscribed and sworn to before me this twenty-sixth day of June, A. D. eighteen hundred and ninety-six.

[SEAL.]

J. F. POSEY, Notary Public.

TERRITORY OF NEW MEXICO,
County of Grant, ss:

Dr. Lewis Kennon, being duly sworn, on his oath says: That he resides in Silver City, New Mexico, but has known the Rio Grande intimately since 1853; that during considerable portions of such period affiant has at various times lived along the course of the Rio Grande, in the Territory of New Mexico; that the general characteristics of said river at the present time are substantially the same as when affiant first knew it in 1853; that the same is not and never has been a navigable stream in New Mexico, or capable or susceptible of being navigated; that it has never been beneficially used by the people in New Mexico for commercial purposes and is incapable of such beneficial use by reason of its rapids, its quicksands, sand bars, shifting banks, and lack of water; that during the period when affiant has known it he has never known of it being used for floatage of logs or rafts or boats; that even at its high flood season in New Mexico it is incapable of being navigated because of the reasons aforementioned.

LEWIS KENNON.

Subscribed and sworn to before me this twenty-sixth day of June, A. D. eighteen hundred and ninety-seven.

[SEAL.]

J. F. POSEY, Notary Public.

TERRITORY OF NEW MEXICO,

County of Grant, ss:

James Brent, being duly sworn, on his oath says: That he has known the Rio Grande River for as many as seventeen years; that he has crossed it a great many times and camped along its shores; that it is not navigable anywhere in New Mexico; neither has it any navigable capacity; that it is full of rapids and sand bars, and has never been used and is incapable of being used by the people for floating logs, except you would pursue each log and get it off the sand bars; and neither can they float rafts or boats thereon; affiant further says that even in its highest floods it would be impossible for a boat to navigate the same; that there is no timber along its banks which can be floated thereon.

And further affiant sayeth not.

JAS. R. BRENT.

Subscribed and sworn to before me this 26th day of June, A. D. eighteen hundred and ninety-seven.

J. F. POSEY, *Notary Public.*

[SEAL]

96 TERRITORY OF NEW MEXICO,

County of Grant, ss:

Richard Hudson, being duly sworn, on his oath says: That he became familiar with the Rio Grande in New Mexico, in the spring of 1863, as a volunteer officer of the United States Army stationed at El Paso, and that he remained at said place of El Paso and at points up and down the Rio Grande from 1863 to 1866; that during such period affiant had every opportunity to observe and did observe the flow of the water and the general condition of the Rio Grande; that during such period, the exact date of which affiant does not remember, said Rio Grande was dry at El Paso and above El Paso for considerable distance, and that this occurred for several periods during such time, a year or more apart; that affiant was then and ever since has remained familiar with the navigable capacity of said river in New Mexico; and that from his own knowledge states that the same at no point in New Mexico during such period has ever been navigable, in the sense that it was put to any beneficial use or could be put to any beneficial use by the people living in the section of the country through which it flows, except for watering stock and diverting its waters, which custom of diverting its waters was in vogue at the time affiant came to this country and affiant has reason to believe for a long time prior thereto; that during the time when affiant was stationed on said river as an officer, and during the period since that time, affiant has never known any rafts, boats, or crafts of any kind to have been used by the people upon such river, except to cross the same during flood times, and affiant unhesitatingly says that it has at all times remained incapable of any such use; that even during its high flood seasons it is incapable of any such use by either rafts or boats; it is incapable of being used for beneficially floating logs on account of the sand bars in its channel and the difficulty of keeping such logs in the water even if there was any timber along its banks, which affiant states there is not at any point within the Territory of New Mexico, and that if anybody ever floated rafts in the same, such

rafts must have been comprised of small cottonwood trees or small underbrush, and must have been inspired with the desire of achieving the impossible than to accomplish any beneficial purpose.

RICHARD HUDSON.

Subscribed and sworn to before me this twenty-sixth day of June, A. D. eighteen hundred and ninety-seven.

[SEAL]

J. F. POSEY, *Notary Public*.

TERRITORY OF NEW MEXICO,

County of Grant, ss:

John D. Bail, being duly sworn, on his oath says: That he resides in Silver City, New Mexico, at present, but that he has known the Rio Grande in the Territory of New Mexico from its Texas boundary north for a period of thirty years, and during the time before railroads were known in New Mexico he has staged along its course from point to point in said Territory a great deal; that he resided upon the same at Las Cruces and Mesilla for a period of ten years; that from his own knowledge of the uses which have been made of said river, and from its capacity, he states that the same is not navigable in the way he understands that term; that is, that it is not capable in its natural condition of being put to any beneficial uses as a highway for commerce or for pleasure; that even during its flood times he has never known it to be navigated or put to any useful purpose, and in his own opinion it is, even at such periods, incapable of being navigated.

Further affiant sayeth not.

JNO. D. BAIL.

Sworn and subscribed before me this day of June, A. D. eighteen hundred and ninety-seven.

[SEAL.]

J. F. POSEY, *Notary Public*.

TERRITORY OF NEW MEXICO,

County of Grant, ss:

James T. Reed, being duly sworn, on his oath says: That he is a surveyor and civil engineer by profession; that he has been engaged ever since 1880 in New Mexico in making surveys both of a Government and private character; that he is a United States mineral surveyor, and that he is acquainted with the Rio Grande River from Fort Quitman, in Texas, about seventy-five miles below El Paso, to the town of Albuquerque; that the same is unnavigable, incapable of being navigated, and unsuceptible of being navigated, and, in fact, has not since affiant become acquainted with the same ever been navigated from said place of Fort Quitman to said place of Albuquerque; that this lack of navigable capacity is caused by the river for its entire distance being a sand bank, shifting current, shallow stream, and even in its highest floods it is impossible of navigation because of its shifting, cutting, and filling-up characteristics and because of the force of its current; that it is now practically the same character of stream as when affiant first knew it in 1880; that since 1880 affiant has even known it to be dry in New Mexico; and that in the year 1880 affiant traveled along the course of the Rio

Affiant says that it can not be used even for floating timbers, and that, even if it could, there is no valuable timber capable of use along its banks or tributary thereto.

JAMES T. REED.

Subscribed and sworn to before me this twenty-sixth day of June,
A. D. eighteen hundred and ninety-seven. J. F. POSEY, *Notary Public.*

J. F. POSEY, *Notary Public.*

[SEAL.]

98

its course,

RICHARD L. POWELL,

eighteen hundred and ninety-seven.

$$[\text{SEAL}_n]$$

J. F. POSEY, *Notary Public.*

TERRITORY OF NEW MEXICO,

County of Grant, ss:

John M. Ginn, being first duly sworn, on his oath says: That he has known the Rio Grande River in New Mexico ever since 1870; that during portions of such period that he has lived along its course, particularly at Fort Seldon, in New Mexico, and that he has been during such time familiar with its entire course through the Territory; that in its general character and condition it is the same to-day as when he
 99 first became acquainted with it; that it is a dangerous, treacherous, sand bar, quicksand stream, never has been navigated or capable of navigation during the period affiant has known it, and has, during such entire time, been incapable of navigation; that he has drank the waters of the river, has been swallowed up in its quicksands, and has for years gazed at its ugly and tortuous current, and been impressed with its ugliness and utter uselessness except for purposes of irrigation; affiant further says that even in its highest floods it is incapable of navigation, and that if, as stated in the affidavit of Brigadier-General Mills in this case, steamboats could ascend for a hundred miles above El Paso, that verily, in the opinion of this affiant, they could only do so by the aid of wings.

Further affiant sayeth not.

JOHN M. GINN.

Subscribed and sworn to before me this twenty-fifth day of June, A. D. eighteen hundred and ninety-seven.

[SEAL.]

J. F. POSEY, *Notary Public.*

EXHIBIT "A."

DEPARTMENT OF THE INTERIOR,

GENERAL LAND OFFICE,

Washington, D. C., Nov. 14th, 1891.

Register and Receiver, Las Cruces, New Mexico.

GENTLEMEN: I enclose herewith copies of selections of lands in your district made the Director of the Geological Survey for permanent sites for irrigating reservoirs under acts of Congress of October 2, 1888, August 30, 1890, and March 3, 1891. The question of permanently withdrawing these lands from entry or filing is now pending, and in order that parties may not be injured by placing improvements upon land which they may be unable to secure title to, you will allow no entries or filings for any of said tracts until further advised.

Acknowledge receipt hereof.

Very respectfully,

(Signed)

W. M. STONE,

Assistant Commissioner.

NEW MEXICO.

Reservoir site No. 38 (plat No. 38, T. 9, 10, and 11 S., R. 3 W., New Mexico principal meridian).

(Recommended to the Secretary of the Interior in letter dated February 27, 1891.)

DESCRIPTION.

On Rio Grande.
Land segregated.

		sec.	1, T.	9 S., R.	3 W.,	40	acres.
	SE. $\frac{1}{4}$ NE. $\frac{1}{4}$	"	1, "	9 "	3 "	40	"
	NE. $\frac{1}{4}$ SE. $\frac{1}{4}$	"	1, "	9 "	3 "	40	"
	SW. $\frac{1}{4}$ SE. $\frac{1}{4}$	"	1, "	9 "	3 "	35.70	"
	Lot 5	"	1, "	9 "	3 "	40	"
	SE. $\frac{1}{4}$ SW. $\frac{1}{4}$	"	1, "	9 "	3 "	40	"
	SE. $\frac{1}{4}$ SE. $\frac{1}{4}$	"	11, "	9 "	3 "	40	"
	NW. $\frac{1}{4}$ NE. $\frac{1}{4}$	"	12, "	9 "	3 "	24.15	"
	Lot 1	"	12, "	9 "	3 "	37.15	"
	Lot 2	"	12, "	9 "	3 "	80	"
100	E. $\frac{1}{2}$ of NW. $\frac{1}{4}$	"	12, "	9 "	3 "	160	"
	SW. $\frac{1}{4}$	"	12, "	9 "	3 "	46.05	"
	Lot 4	"	12, "	9 "	3 "	37.75	"
	Lot 3	"	12, "	9 "	3 "	40	"
	SW. $\frac{1}{4}$ NW. $\frac{1}{4}$	"	12, "	9 "	3 "	160	"
	NW. $\frac{1}{4}$	"	13, "	9 "	3 "	38.10	"
	Lot 1	"	13, "	9 "	3 "	9.05	"
	Lot 2	"	13, "	9 "	3 "	80	"
	W. $\frac{1}{2}$ SW. $\frac{1}{4}$	"	13, "	9 "	3 "	39	"
	Lot 3	"	13, "	9 "	3 "	26.05	"
	Lot 4	"	13, "	9 "	3 "	80	"
	E. $\frac{1}{2}$ NE. $\frac{1}{4}$	"	14, "	9 "	3 "	80	"
	E. $\frac{1}{2}$ SE. $\frac{1}{4}$	"	14, "	9 "	3 "	160	"
	NE. $\frac{1}{4}$	"	23, "	9 "	3 "	80	"
	E. $\frac{1}{2}$ SW. $\frac{1}{4}$	"	23, "	9 "	3 "	80	"
	N. $\frac{1}{2}$ SE. $\frac{1}{4}$	"	23, "	9 "	3 "	24	"
	Lot 1	"	23, "	9 "	3 "	38.90	"
	Lot 2	"	23, "	9 "	3 "	80	"
	W. $\frac{1}{2}$ NW. $\frac{1}{4}$	"	24, "	9 "	3 "	14.05	"
	Lot 1	"	24, "	9 "	3 "	15.01	"
	Lot 2	"	24, "	9 "	3 "	40	"
	NW. $\frac{1}{4}$ SW. $\frac{1}{4}$	"	24, "	9 "	3 "	26.35	"
	Lot 4	"	24, "	9 "	3 "	14	"
	Lot 3	"	24, "	9 "	3 "	9.94	"
	Lot 1	"	25, "	9 "	3 "	80	"
	E. $\frac{1}{2}$ NW. $\frac{1}{4}$	"	26, "	9 "	3 "	40	"
	SW. $\frac{1}{4}$ NE. $\frac{1}{4}$	"	26, "	9 "	3 "	35.08	"
	Lot 1	"	26, "	9 "	3 "	7.05	"
	Lot 2	"	26, "	9 "	3 "	80	"
	W. $\frac{1}{2}$ SE. $\frac{1}{4}$	"	26, "	9 "	3 "	36.07	"
	Lot 3	"	26, "	9 "	3 "	30.15	"
	Lot 4	"	26, "	9 "	3 "	40	"
	SW. $\frac{1}{4}$ NW. $\frac{1}{4}$	"	26, "	9 "	3 "	160	"
	SW. $\frac{1}{4}$	"	26, "	9 "	3 "	80	"
	E. $\frac{1}{2}$ SE. $\frac{1}{4}$	"	27, "	9 "	3 "	40	"
	SE. $\frac{1}{4}$ SE. $\frac{1}{4}$	"	33, "	9 "	3 "	160	"
	SW. $\frac{1}{4}$	"	34, "	9 "	3 "	80	"
	E. $\frac{1}{2}$ NE. $\frac{1}{4}$	"	34, "	9 "	3 "	160	"
	SE. $\frac{1}{4}$	"	34, "	9 "	3 "	160	"

	W. $\frac{1}{2}$ NW. $\frac{1}{4}$	sec. 35, T. 9 S., R. 3 W., 80	acres,
	NE. $\frac{1}{4}$ NW. $\frac{1}{4}$	" 35, " 9 " " 3 "	40 "
	Lot 1	" 35, " 9 " " 3 "	26.11 "
	Lot 2	" 35, " 9 " " 3 "	32.30 "
	Lot 3	" 35, " 9 " " 3 "	6.05 "
	Lot 4	" 35, " 9 " " 3 "	39.01 "
	Lot 5	" 35, " 9 " " 3 "	31.05 "
	Lot 1	" 2, " 10 " " 3 "	2.76 "
	Lot 1	" 3, " 10 " " 3 "	21.43 "
	Lot 2	" 3, " 10 " " 3 "	27.97 "
	Lot 3	" 3, " 10 " " 3 "	39.27 "
	W. $\frac{1}{2}$ NW. $\frac{1}{4}$	" 3, " 10 " " 3 "	80 "
	Lot 4	" 3, " 10 " " 3 "	22.24 "
	Lot 5	" 3, " 10 " " 3 "	5.97 "
	Lot 6	" 3, " 10 " " 3 "	31.08 "
	Lot 1	" 4, " 10 " " 3 "	40.01 "
	Lot 2	" 4, " 10 " " 3 "	40.03 "
	Lot 5	" 4, " 10 " " 3 "	39.06 "
	Lot 6	" 4, " 10 " " 3 "	16.66 "
101	SE. $\frac{1}{4}$ NE. $\frac{1}{4}$	" 4, " 10 " " 3 "	40 "
	SE. $\frac{1}{4}$ NW. $\frac{1}{4}$	" 4, " 10 " " 3 "	40 "
	W. $\frac{1}{2}$ SW. $\frac{1}{4}$	" 4, " 10 " " 3 "	80 "
	Lot 7	" 4, " 10 " " 3 "	27.85 "
	Lot 8	" 4, " 10 " " 3 "	19 "
	SE. $\frac{1}{4}$ SE. $\frac{1}{4}$	" 5, " 10 " " 3 "	40 "
	NE. $\frac{1}{4}$ NE. $\frac{1}{4}$	" 8, " 10 " " 3 "	40 "
	W. $\frac{1}{2}$ NW. $\frac{1}{4}$	" 9, " 10 " " 3 "	80 "
	W. $\frac{1}{2}$ SW. $\frac{1}{4}$	" 9, " 10 " " 3 "	80 "
	Lot 1	" 9, " 10 " " 3 "	34.24 "
	Lot 2	" 9, " 10 " " 3 "	3.04 "
	Lot 3	" 9, " 10 " " 3 "	39.07 "
	Lot 4	" 9, " 10 " " 3 "	33.07 "
	Lot 5	" 9, " 10 " " 3 "	39.09 "
	Lot 6	" 9, " 10 " " 3 "	10.08 "
	Lot 7	" 9, " 10 " " 3 "	1.29 "
	Lot 1	" 10, " 10 " " 3 "	2.36 "
	Lot 1	" 15, " 10 " " 3 "	22.03 "
	Lot 2	" 15, " 10 " " 3 "	22.01 "
	Lot 3	" 15, " 10 " " 3 "	22.18 "
	Lot 4	" 15, " 10 " " 3 "	22.25 "
	NW. $\frac{1}{4}$	" 16, " 10 " " 3 "	160 "
	SW. $\frac{1}{4}$	" 16, " 10 " " 3 "	160 "
	S. $\frac{1}{2}$ NE. $\frac{1}{4}$	" 16, " 10 " " 3 "	80 "
	N. $\frac{1}{2}$ SE. $\frac{1}{4}$	" 16, " 10 " " 3 "	80 "
	SE. $\frac{1}{4}$ SE. $\frac{1}{4}$	" 16, " 10 " " 3 "	40 "
	SW. $\frac{1}{4}$ SE. $\frac{1}{4}$	" 16, " 10 " " 3 "	40 "
	Lot 2	" 16, " 10 " " 3 "	36.39 "
	Lot 1	" 16, " 10 " " 3 "	33.37 "
	E. $\frac{1}{2}$ SE. $\frac{1}{4}$	" 17, " 10 " " 3 "	80 "
	NE. $\frac{1}{4}$	" 20, " 10 " " 3 "	160 "

SE. 1/4	sec. 20, T. 10 S., R. 3 W.,	160	acres.
E. 1/4 NW. 1/4	" 20, " 10 " " 3 "	80	"
SW. 1/4 NW. 1/4	" 20, " 10 " " 3 "	40	"
E. 1/4 SW. 1/4	" 20, " 10 " " 3 "	80	"
SW. 1/4 SW. 1/4	" 20, " 10 " " 3 "	40	"
NE. 1/4	" 21, " 10 " " 3 "	160	"
NW. 1/4	" 21, " 10 " " 3 "	160	"
SW. 1/4	" 21, " 10 " " 3 "	160	"
W. 1/4 SE. 1/4	" 21, " 10 " " 3 "	80	"
NE. 1/4 SE. 1/4	" 21, " 10 " " 3 "	40	"
NW. 1/4	" 28, " 10 " " 3 "	160	"
NW. 1/4 NE. 1/4	" 28, " 10 " " 3 "	40	"
N. 1/4 SW. 1/4	" 28, " 10 " " 3 "	80	"
NE. 1/4	" 29, " 10 " " 3 "	160	"
SE. 1/4	" 29, " 10 " " 3 "	160	"
NW. 1/4	" 29, " 10 " " 3 "	160	"
NE. 1/4 SW. 1/4	" 29, " 10 " " 3 "	40	"
N. 1/4 SW. 1/4	" 29, " 10 " " 3 "	80	"
N. 1/4 NE. 1/4	" 32, " 10 " " 3 "	80	"
SE. 1/4 NE. 1/4	" 32, " 10 " " 3 "	40	"
SE. 1/4	" 32, " 10 " " 3 "	160	"
E. 1/4 NE. 1/4	" 32, " 10 " " 3 "	80	"
NW. 1/4 NW. 1/4	" 32, " 10 " " 3 "	40	"
N. 1/4 NE. 1/4	" 5, " 11 " " 3 "	80	"
Lot 1	" 5, " 11 " " 3 "	43.01	"
Lot 2	" 5, " 11 " " 3 "	43.03	"
SE. 1/4	" 5, " 11 " " 3 "	160	"
SE. 1/4 SW. 1/4	" 5, " 11 " " 3 "	40	"
NE. 1/4	" 7, " 11 " " 3 "	160	"
N. 1/4 SE. 1/4	" 7, " 11 " " 3 "	80	"
SW. 1/4 SE. 1/4	" 7, " 11 " " 3 "	40	"
W. 1/4 NE. 1/4	" 8, " 11 " " 3 "	80	"
NE. 1/4 NE. 1/4	" 8, " 11 " " 3 "	40	"
NW. 1/4	" 8, " 11 " " 3 "	160	"
SE. 1/4 SW. 1/4	" 8, " 11 " " 3 "	40	"
W. 1/4 SW. 1/4	" 8, " 11 " " 3 "	80	"
NW. 1/4	" 14, " 11 " " 3 "	160	"

Area segregated. 8,507.14 "

NEW MEXICO.

Reservoir site No. 39 (plat No. 39). Recommended for segregation in letter dated Feb. 27, 1891. T. 15 S., R. 4 W., and 16 S., R. 4 W., New Mexico principal meridian.

DESCRIPTION.

On Rio Grande.
Lands segregated.

S. $\frac{1}{2}$ SE. $\frac{1}{4}$	sec. 5, T. 15 S., R. 4 W.,	80	acres.
SE. $\frac{1}{4}$ SW. $\frac{1}{4}$	" 5, " 15 " " 4 " "	40	"
S. $\frac{1}{2}$ NE. $\frac{1}{4}$	" 8, " 15 " " 4 " "	320	"
E. $\frac{1}{2}$ NW. $\frac{1}{4}$	" 8, " 15 " " 4 " "	80	"
SW. $\frac{1}{4}$ NW. $\frac{1}{4}$	" 8, " 15 " " 4 " "	40	"
Entire	" 17, " 15 " " 4 " "	640	"
E. $\frac{1}{2}$	" 20, " 15 " " 4 " "	320	"
NE. $\frac{1}{4}$ NW. $\frac{1}{4}$	" 20, " 15 " " 4 " "	40	"
SE. $\frac{1}{4}$ SW. $\frac{1}{4}$	" 20, " 15 " " 4 " "	40	"
E. $\frac{1}{2}$	" 29, " 15 " " 4 " "	320	"
S. $\frac{1}{2}$ NW. $\frac{1}{4}$	" 29, " 15 " " 4 " "	80	"
NE. $\frac{1}{4}$ NW. $\frac{1}{4}$	" 29, " 15 " " 4 " "	40	"
SE. $\frac{1}{4}$ NE. $\frac{1}{4}$	" 30, " 15 " " 4 " "	40	"
SE. $\frac{1}{4}$	" 30, " 15 " " 4 " "	160	"
E. $\frac{1}{2}$	" 31, " 15 " " 4 " "	320	"
W. $\frac{1}{2}$	" 32, " 15 " " 4 " "	320	"
W. $\frac{1}{2}$ NE. $\frac{1}{4}$	" 32, " 15 " " 4 " "	80	"
W. $\frac{1}{2}$ SE. $\frac{1}{4}$	" 32, " 15 " " 4 " "	80	"
SE. $\frac{1}{4}$ SE. $\frac{1}{4}$	" 32, " 15 " " 4 " "	40	"
Entire	" 5, " 16 " " 4 " "	640	"
E. $\frac{1}{2}$	" 6, " 16 " " 4 " "	320	"
SE. $\frac{1}{4}$ SW. $\frac{1}{4}$	" 6, " 16 " " 4 " "	40	"
E. $\frac{1}{2}$	" 7, " 16 " " 4 " "	320	"
E. $\frac{1}{2}$ NW. $\frac{1}{4}$	" 7, " 16 " " 4 " "	80	"
E. $\frac{1}{2}$ SW. $\frac{1}{4}$	" 7, " 16 " " 4 " "	80	"
Entire	" 8, " 16 " " 4 " "	640	"
W. $\frac{1}{2}$	" 17, " 16 " " 4 " "	320	"
W. $\frac{1}{2}$ NE. $\frac{1}{4}$	" 17, " 16 " " 4 " "	80	"
W. $\frac{1}{2}$ SE. $\frac{1}{4}$	" 17, " 16 " " 4 " "	80	"
E. $\frac{1}{2}$	" 18, " 16 " " 4 " "	320	"
N. $\frac{1}{2}$ NE. $\frac{1}{4}$	" 19, " 16 " " 4 " "	80	"
SE. $\frac{1}{4}$ NE. $\frac{1}{4}$	" 19, " 16 " " 4 " "	40	"
NW. $\frac{1}{4}$	" 20, " 16 " " 4 " "	160	"
N. $\frac{1}{2}$ SW. $\frac{1}{4}$	" 20, " 16 " " 4 " "	80	"

Area segregated. 6,540 acres.

5.60 acres were added; see sec. 8 and 17, T. 16 S., 4 N.

NEW MEXICO.

103 Reservoir site No. 37 (plat No. 37). Recommended for segregated in letter dated Feb'y 27, 1891. Township 8 S., range 8 W., New Mexico principal meridian.

DESCRIPTION.

On Hot Springs Indian Reservation.

Lands segregated:

SW. $\frac{1}{4}$ NW. $\frac{1}{4}$ sec. 25, T. 8 S., R. 8 W.,	40	acres.
Lot 4	" 25, " 8 " " 8 "	22.98 "
Lot 3	" 25, " 8 " " 8 "	22.92 "
S. $\frac{1}{2}$ NE. $\frac{1}{4}$	" 26, " 8 " " 8 "	80 "
NW. $\frac{1}{4}$ NE. $\frac{1}{4}$	" 26, " 8 " " 8 "	40 "
E. $\frac{1}{2}$ NW. $\frac{1}{4}$	" 26, " 8 " " 8 "	80 "
Lot 1	" 26, " 8 " " 8 "	22.96 "
Lot 2	" 26, " 8 " " 8 "	22.89 "

Area segregated 371.73 acres.

Remainder of reservoir on Hot Springs Indian Reservation.

UNITED STATES LAND OFFICE,
Las Cruces, N. M., June 22, 1897.

I hereby certify that the foregoing nine pages hereto attached are a true, correct, and complete copy of the original departmental letter dated "C" November 14, 1891, now on file in this office.

EDWIN E. SLUDER, *Register*.

EXHIBIT "B."

[Copy.]

DEPARTMENT OF THE INTERIOR,
Washington, D. C., August 18, 1894.*The Commissioner of the General Land Office.*

SIR: In the matter of the selection of the following reservoir sites, the abstracts furnished by your office show that a large part of each is not subject to reservation for the purpose intended, an account of previous dispositions, and the attention of the Director of the Geological Survey has been called thereto.

Under date of May 25, 1892, he reports, however, that in the near future all of these sites will be needed for the storage of waters for public purposes, and that while some of the lands covered by the sites will have to be acquired by condemnation, or other means, before the remaining lands can be used for reservoir purposes, and the future necessities must demand their acquirement in maintaining a proper storage of water, if open to entry under the general land laws.

Under this view I have to direct that all lands covered by these sites which are legally subject to reservation continue withdrawn from disposition to await further action by Congress in the matter of these reservoir sites.

Proper notations should be made upon your records and the local officers advised accordingly.

The sites referred to are as follows:

Colorado:

Reservoir sites Nos. 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 19, 21, 25, 27, 28, 30, 31, 33, 37, 40, 41, 42, 43, 46, 48, 50, 51, 53, and 55.

New Mexico:

104 Reservoir sites Nos. 7, 31, 32, 33, 34, 36, 38, and 39.
The papers relating to these sites are herewith returned.
Very respectfully,

HOKE SMITH, *Secretary*.

"A."

DEPARTMENT OF THE INTERIOR,
GENERAL LAND OFFICE,
Washington, D. C., August 18, 1894.

The Commissioner of the General Land Office.

SIR: In the matter of reservoir site No. 37 in the Las Cruces land district, New Mexico, selected by the Director of the Geological Survey, it appears that the greater portion of the lands it is desired to reserve lies within the Hot Springs Indian Reservation.

Under date of May 25, 1892, the Director returns the papers relative to said site, accompanied by a statement in which the lands desired to be reserved in said Indian reservation are designated by legal subdivisions of independent sections, placed upon said reservation for the purpose of identifying the lands desired to be reserved.

From this date the lands can be clearly identified, and I therefore approve of the selection and direct that all lands legally subject to reservation, covered by said sites, be withdrawn from this position to await further action of Congress in the matter of reservoir sites.

To this end you will make proper notes upon your office records and advise the local officers accordingly.

The papers relating to the site are herewith returned.

Very respectfully,

HOKE SMITH, *Secretary*.

"C."

DEPARTMENT OF THE INTERIOR,
GENERAL LAND OFFICE,
Washington, D. C., Sept. 26, 1894.

Register and Receiver, Las Cruces, New Mexico.

GENTLEMEN: By letter "C" of November 14, 1891, "copies of selections of lands in your district, made by the Director of the Geological Survey, for permanent sites for irrigating reservoirs, under acts of Congress of October 2, 1888, August 30, 1890, and March 3, 1891," were transmitted to your office and you were directed not to allow entries or filings for any of the tracts covered by said selections until further advised.

By letter August 18, 1894, the honorable Secretary of the Interior returned the papers in the reservoir site No. 37, embracing lands in sec. 25 and 26, T. 8 S., R. 8 W., and lands within the Hot Spring Indian Reservation, in tps. 8 and 9 S., R. 7 and 8 W., designated by the Director of the Geological Survey, by "legal subdivisions of independent sections, placed upon said reservation for the purpose of identifying the lands
105 desired to be reserved," with his approval. It is directed by the honorable Secretary that "all lands legally subject to reservation

covered by said site be withdrawn from disposition, to await the further action of Congress in the matter of reservoir sites."

A copy of said letter of August 18, 1894, is herewith enclosed, and, as directed therein, the lands covered by said site No. 37 are continued withdrawn from disposition, and you will be governed accordingly.

Very respectfully,

S. W. LAMOREAU,
Commissioner.

"A."

DEPARTMENT OF THE INTERIOR,
Washington, D. C., November 8, 1894.

Register and Receiver, Las Cruces, New Mexico.

SIR: Referring to your letter of Oct. 2, 1894, in reply to office letter of Sep. 26, relating to certain reservoir sites, you are advised that those sites were selected by the Director of the Geological Survey, under the act of Aug. 30, 1890 (26 Stat., 371-391, also general circular, p. 71), and are reserved from entry or settlement until otherwise provided by law. These sites have always been designated by number, and your office has had instructions regarding them in former letters. You will carry out the instructions of office letter of Sep. 26, 1894.

Under secs. 18 to 21, act of Mch. 3, 1891 (26 Stat., 1095), corporations, individuals, and associations of individuals filed certain maps and papers, in conformity with the regulations of Feb. 20, 1884, as applications for right of way for canals and reservoirs for irrigation purposes, which are to be noted on the local office records, as required in paragraph 25. These applications are submitted to the honorable Secretary for his approval. When they are approved, copies of the map are sent to the local offices and there noted on the records. (See paragraph 26, circular Feb. 20, 1894.) The public land crossed by such approved rights of way may be disposed of in the usual manner, subject to such rights of way. These are not numbered, and record is kept of them in the usual manner, as of application and correspondence generally, and by the notations required by the circular as above. These rights of way resemble in character and incidents the railroad rights of way, there being but few essential differences.

Very respectfully,

EDWIN A. BOWERS,
Acting Commissioner.

UNITED STATES LAND OFFICE,
Las Cruces, New Mexico, June 22nd, 1897.

I hereby certify that the foregoing copies of letters hereto attached, first, of date of August 18, 1894, from Hoke Smith, Secretary, in reference to reservoir sites in Colorado and New Mexico; second, of same date, from same party, marked "A," in reference to reservoir site No. 37; third, of date Sep. 26, 1894, from S. W. Lamoreaux, marked "C," in reference to reservoir site No. 37; and, fourth, under date of Nov. 8th, 1894, from Edwin A. Bowers, Acting Commissioner, marked "F," in answer to office letter Oct. 2nd, 1894, are true and correct copies of the originals now on file in this office.

EDWIN E. SLUDER, *Register.*

EXHIBIT "H-1."

[Copy.]

LAS CRUCES, NEW MEXICO, June 18, 1897.

To the Honorable Secretary of the Interior, Washington, D. C.

SIR: Under and in accordance with a resolution of instructions of the board of directors of this company made this day, copy of which is hereto attached, application is hereby made for and on behalf of The Rio Grande Dam & Irrigation Company, under the chapter 335, "entitled an act to provide for the use and occupation of reservoir sites reserved," for the granting to this company for use as reservoir sites the land embraced in those certain reservoir sites heretofore surveyed and segregated by the United States Government and designated as "U. S. reservoir survey No. 38" and "U. S. reservoir survey No. 39," situated in the bed of the Rio Grande and being in the counties of Sierra and of Socorro, respectively, in the Territory of New Mexico, and further designated by the Commissioner of the General Land Office by letter "C," of November 14, 1891, addressed to register and receiver, Las Cruces, New Mexico.

Applicant states that inasmuch as the articles of incorporation and other corporate papers are on file in the office of and approved by the honorable Secretary of the Interior, it does not forward such papers with this application, and inasmuch as the reservoir sites above applied for have already been thoroughly surveyed and segregated by and at the expense of the U. S. Government and the boundaries thereof thoroughly marked and delineated, and inasmuch as this applicant, by occupying said sites under said act so embraced in said chapter 335, will take the same under the restrictions therein contained, applicant has assumed that it is entitled to said reservoir sites without any further survey thereof; but applicant hereby expresses its desire to comply with the rulings of the honorable Secretary of the Interior concerning such survey under event the honorable Secretary is of the opinion that such surveys are necessary, and the applicant hereby expresses its intention of making the same in good faith as required by the honorable Secretary, and hereby requests instructions as to any requirements in such matter and the extension to this applicant of a sufficient length of time in which to comply with such requirements.

[SEAL.]

THE RIO GRANDE DAM & IRRIGATION CO.,
(Signed) By EDWIN C. ROBERTS, *President*.

Attested:

(Signed)

W. T. JOHNS.

TERRITORY OF NEW MEXICO,

County of Dona Ana:

Edwin C. Roberts, being duly sworn, on his oath says: That
107 he is the president of the Rio Grande Dam & Irrigation Company, organized under the laws of the Territory of New Mexico; that W. T. Johns, whose name is signed above, is the secretary of said company, and that the seal affixed is the seal of said company; that the reservoir sites named in the above communication were on the 18th day of June, A. D. 1897, at a meeting of the directors of said company, adopted

as reservoir of said company, as per a copy of the minutes of said directors' meeting hereto attached, and to be bounded and described as at present bounded and described in the United States Government survey thereof. And further affiant saith not.

(Signed)

EDWIN C. ROBERTS.

Sworn to and subscribed before me this 18th day of June, 1897.

[SEAL.]

(Signed)

EDWIN E. SLUDER, *Register*.

Resolved, by the directors of this company, that this company should proceed, in accordance with the privilege extended by the act of Congress of the United States approved February 26, 1897, entitled, "An act to provide for the use and occupation of reservoir sites reserved," same being chapter 335 of the Acts of 1897, to acquire the land embraced in U. S. reservoir sur. No. 38 and U. S. reservoir sur. No. 39, lying and being in the bed of the Rio Grande River, in the counties of Sierra and Socorro, in the Territory of New Mexico, and to this end the president of this company is hereby instructed to file application with the honorable Secretary of the Interior therefor, and such reservoir sites so surveyed and segregated and platted on the Government maps are hereby adopted as reservoir sites of this company.

(Signed)

W. T. JOHNS, *Secretary*.

U. S. LAND OFFICE,
Las Cruces, N. M., June 21, 1897.

I hereby certify that the foregoing and hereto attached is a true, correct, and complete copy of application filed June 18, 1897, by the Rio Grande Dam & Irrigation Company for entry of U. S. reservoir sites described as surveys Nos. 38 and 39.

EDWIN E. SLUDER, *Register*.

EXHIBIT G.

DEPARTMENT OF STATE,
INTERNATIONAL (WATER) BOUNDARY COMMISSION,
UNITED STATES AND MEXICO, TREATIES OF 1884 AND 1889,
El Paso, Texas, November 17, 1896.

To the Honorable Secretary of State, Washington, D. C.

SIR: Referring to your letter of August 8th, transmitting copy of a petition addressed to this Government by Don Andres Horeasitas, attorney of the inhabitants of Paso del Norte, Mexico, in which he requests the Mexican Government to recommend to that of the United States the suspension of all work in the Rio Bravo (Grande) by the Rio Grande Irrigation Company, Limited, and your request for suggestions from me on the subject, I beg to submit herewith my report on the matter.

As stated to you in my last letter of October 29th, I have withheld this report of necessity because the investigations going on by the engineers of the joint commission regarding the amount of water taken out by the Americans and the former flow of the river, year by year, had not been completed up to this date, and it was impossible for me to make an intelligent report until they were.

With your permission I called upon the Secretary of the Interior when in Washington and learned what I could about the status of this Rio Grande Irrigation Company, Limited, and found that on February 1, 1895, the Secretary of the Interior—then Mr. Hoke Smith—had approved the application for said company for right of way “subject to any valid interfering rights with the right of way on account of the proposed reservoir.” (See copy enclosed, marked “A.”) Just what significance this reservation of “valid interfering rights” may have I am unable to understand, but certainly according to common law it should be understood that there should be no interference with any prior appropriation of water below the proposed dam and reservoir.

This proposed dam and reservoir is at a location called Elephant Butte, about 125 miles above El Paso, a distance so great that in this arid climate it is utterly impracticable to carry water to this vicinity, and consequently could be of no benefit to agricultural interests here, notwithstanding the statements in their prospectus that they propose to provide water not only here in Texas, but on the Mexican side of the river.

At the same time I learned that this same company had on file applications for two additional dams and reservoirs, one at Rincon, New Mexico, about 100 miles above El Paso, and another at Fort Selden, about 60 miles above.

At the latter place a gentleman by the name of Ernest Dale Owens had also an application on file at the same point as the Rio Grande Land and Irrigation Company, which antedated all the applications of the last-mentioned company.

For a full understanding of the status of these three last-mentioned applications, I beg to refer to a communication from the Commissioner of the General Land Office to the Secretary of the Interior dated August 15, 1896, fully discussing their relative merits. (Copy herewith enclosed, marked “B.”)

The Secretary had, when I met him, under consideration and was about determining the question as to approval or disapproval of these three last applications, but at my verbal suggestion he promised to hold them until my letter to you of October 29th, hereinbefore mentioned, should be referred to him by your Department.

109 The investigations of the engineers of the joint commission into the amount of water taken from the Rio Grande and its tributaries in Colorado and New Mexico since prior to 1880 up to this date, show that prior to 1880 there were in Colorado 511 canals, using 471,000 acre-feet, and irrigating 121,000 acres of land. That this number of ditches and amount of land irrigated kept increasing year by year until at this date there are 925 canals using 556,000 acre-feet of water and irrigating 318,000 acres of land.

In New Mexico there were prior to 1880 563 canals, using 597,000 acre-feet of water and irrigating 183,000 acres of land, and at the present date there are 603 canals, using 388,000 acre-feet of water and irrigating 186,000 acres of land.

It will be observed here that the greatest increase in canals and irrigation for the past sixteen years has been in Colorado. As there was prior to 1880 a scarcity of water in the Rio Grande at El Paso and, in fact, a

dry river once in about seven years, it is clear that any increased use of water above El Paso would increase that scarcity. 1879 was the driest year of record prior to 1889. In 1889 the river was dry as far north as Albuquerque; since 1889 the river has been low at El Paso every year but one, namely, 1891, and dry during a large part of several years. The dry river of 1889 lasted longer than any of the others; no water passed El Paso that summer for over four months. The water fell earlier in the spring of 1896 than ever; the flow, which had been small all of the spring, ceasing May 26th, but the copious rains on the New Mexican drainage sent down water in July, and the flow of the river was intermittent after that date. Floods are not so frequent as in former years, the last destructive one occurring in 1884. There was a small flood in 1891, but it was not so large as that of 1884.

The records of the flow of the river for the past 16 years are very meagre; that for 11 months prior to March 31, 1890, was 450,000 acre-feet. This includes the long drought of 1889. For the year ending March 31, 1891, the flow was 1,100,000 acre-feet; for 1892, 1,850,000 acre-feet, and for 1893, 875,000 acre-feet.

What has been stated above is a very brief extract from the large mass of information and statistics taken by our engineers from which I form the following conclusions:

That the probable flow of water in the river here is likely to be ample for the supply of the proposed international reservoir after deductions are made for all the small reservoirs that are likely to be constructed for the storage in Colorado and the probable increase of canals in Colorado and New Mexico; but that the flow will not be sufficient to supply the proposed international reservoir here and allow for the supply for the proposed reservoir of The Rio Grande Irrigation Company, Limited, at

Elephant Butte, in New Mexico, or any other similar reservoirs in New Mexico, and but one of these schemes can be successfully carried out.

The general results that the joint commission are now arriving at concerning the flow of the river from the investigations of the engineers are: That the flow here at El Paso has been decreased by the appropriation of waters above in the last 16 years about 1,000 second-feet, and that the water appropriated by the citizens of Mexico for over forty years past in the valley of El Paso amounted to about 400 second-feet, and that that appropriated by the citizens of the United States in the same valley for the same length of time amounts to about 350 second-feet. All this of course is approximate, but it is as near correct as can possibly be arrived at by any data or evidence now available.

I would therefore suggest that these papers be referred to the Hon. Secretary of the Interior, with the request that no further grants for reservoirs be made in New Mexico, and that, if practicable, the approval of the reservoir of the Rio Grande Land and Irrigation Company, Limited, at Elephant Butte be canceled or withdrawn, and if not practicable to cancel or withdraw the same, that such executive and legislative restriction be placed upon it as to prohibit it from using any part of the flow of the river to which the inhabitants of either bank of the river below may have a prior right by appropriation, and that some prompt and efficient remedy be provided the possessors of these prior rights by

appropriation in case the company should use any water to which the inhabitants above referred to are entitled.

As I understand the matter, the irrigation laws are so imperfect and crude at this date that even in the same State or Territory there is no effective legal remedy when water is thus injuriously appropriated, and in separate States it is still more difficult, while to the inhabitants of Mexico it would be impossible to make any successful effort at redress.

I return herewith copy of the protest with attached papers, among which I beg to call attention to the letter of W. E. Baker, dated Las Cruces, N. M., July 12, 1895, who, I understand, has charge of the land office there, in which letter he states that the only "patent" for the Elephant Butte Reservoir of the Rio Grande Dam & Irrigation Company consists of the words "Department of the Interior, Washington, D. C., February 1, 1895. Approved subject to any valid existing rights. Hoke Smith, Secretary." This is broader and more comprehensive than the words used in the enclosed letter marked "A" regarding the reservation of rights, and is probably the exact language given to the promoters of the Rio Grande Dam & Irrigation Company, Limited.

ANSON MILLS,
Col. 3d Cav., U. S. A., Commissioner.

EXHIBIT "G."

DEPARTMENT OF STATE,
Washington, Nov. 30, 1896.

111 *The Honorable Secretary of the Interior.*

SIR: I have the honor to invite your attention to the enclosed copy of a letter dated November 17, 1896, and accompanying papers from Col. Anson Mills, of the U. S. Army, who is a member of a joint commission appointed by the U. S. and the Republic of Mexico to report upon the best and most feasible mode—whether by a dam across the Rio Grande River near El Paso, Texas, or otherwise—of so regulating the use of the waters of the Rio Grande River as to secure to each country and its inhabitants their legal and equitable rights and interests in said waters for irrigation purposes.

This examining board was appointed in pursuance of a concurrent resolution of Congress approved April 29, 1890, which recites the fact that by reason of the irrigating ditches and canals leading from the upper waters of the Rio Grande in the State of Colorado and Territory of New Mexico, an insufficient quantity of water remains in the river to irrigate the lands adjacent to the river after it leaves New Mexico, thereby rendering the lands arid and unproductive, to the great detriment of the citizens of both countries who live along the Rio Grande below the line of New Mexico. The resolution then authorizes the President to enter into negotiations with the Government of Mexico with a view to remedy this condition. I enclose a copy of the resolution.

The duty imposed upon this board of examiners was to ascertain:

- (1) The amount of water taken from the Rio Grande by the irrigation canals constructed in the United States.
- (2) The average amount of water in said river from year to year before the construction of said irrigation canals and since their construction.

(3) The best and most practicable mode of regulating the use of the waters of the Rio Grande so as to secure to each country and to the land owners on both sides of the river their legal and equitable rights and interests in said waters.

August 4th last the Mexican minister to the United States transmitted to this Department a copy of a petition forwarded by the inhabitants of the city of Paso del Norte, Mexico, calling attention to the distressing situation in the towns on the Mexican side of the Rio Grande caused by the immoderate use of the waters of the river for irrigation purposes by the adjacent owners in the United States above the boundary line. This petition states that the efforts of the two Governments to remedy this condition will be fruitless if, in addition to the 40 dams already existing in Colorado, the Rio Grande Irrigation and Land Company, Limited, should be permitted to construct, as it proposes, a dam across the Rio Grande at Elephant Butte in New Mexico. The Mexican minister said that his Government regarded this petition as well founded, and requested the United States to adopt such measures as may be in its power to put a stop to the works undertaken by the Rio Grande Irrigation and Land Company, Limited, until the effect of that company's proposed works upon the practicability of the international scheme could be considered by the examining board and determined upon to the satisfaction of the two Governments. A copy of the Mexican petition was sent to Col. Mills for his suggestions. The enclosed letter of November 17, 1896, to which your attention is invited, is his reply.

Col. Mills says that the proposed dam and reservoir of the Rio Grande Irrigation and Land Company is located about 125 miles above El Paso, and that it will be useless at that distance to furnish water for irrigation in the vicinity of El Paso and below. He says, furthermore, that he is informed that the same company has dams and reservoirs—one at Rincon, New Mexico, about 100 miles above El Paso, and another at Fort Selden, about 60 miles above; also that at the latter place a man named Ernest Dale Owen has applied for permission to erect a dam and reservoir.

It is understood that the Rio Grande Irrigation and Land Company, Limited, acquired its right to build the reservoir it is now constructing from a corporation existing under the laws of New Mexico under the name of the "Rio Grande Dam and Irrigation Company," to which company the right of way for the construction of the storage dam at Elephant Butte was granted by the Secretary of the Interior February 1, 1895, under the provisions of the act of March 3, 1891.

Col. Mills gives it as his opinion that the probable flow of water in the river will be sufficient to supply the proposed international reservoir after deducting for all the small reservoirs now in operation and likely to be constructed above, but that the flow will not be sufficient to supply the proposed international reservoir and allow for the supply of the proposed reservoir of the Rio Grande Irrigation and Land Company, Limited, at Elephant Butte, or any other reservoirs upon the same scale, and that the scheme to build an international reservoir will have to be abandoned unless the completion of the works proposed by the Rio Grande Irrigation and Land Company, Limited, and by Owen, is prevented. Col. Mills' letter suggests that the rights obtained from the United States by the Rio Grande Irrigation and Land Company, Limited, may be subject

to conditions in favor of the rights of those who live below, which, on a proper showing, might enable the Secretary of the Interior to cancel the grant made to that company. The other applications for permission to build reservoirs for storage of the waters of the Rio Grande mentioned by Col. Mills have not, it is assumed, yet been finally acted upon.

The circumstances being as above stated, I desire to suggest the propriety of declining to grant any additional rights to build dams and reservoirs as applied for—certainly until the negotiations now
113 pending between Mexico and the United States have reached a final conclusion. I desire also to suggest that an investigation may be made of the rights granted to the Rio Grande Irrigation and Land Company, Limited, or any acts or proceedings done by that company by virtue of such rights, with a view to ascertaining whether there is any legal power to cancel those rights, and if the power exists whether it can be exercised without injustice to the parties directly and indirectly interested in that enterprise.

With a request for your earliest practicable attention to this matter, I have the honor to be, sir, your obedient servant,

RICHARD OLNEY.

EXHIBIT "F."

DEPARTMENT OF STATE,

Washington, January 11, 1891.

The Hon. Secretary of the Interior:

SIR: In your letter of December 19, 1896, relative to the reservoir which the Rio Grande Dam & Irrigation Company, or another corporation claiming the rights of that company, intends to build at Elephant Butte, New Mexico, you informed me that you had, in compliance with my suggestions of November 30, 1896, directed the Commissioner of the General Land Office to suspend action on any and all applications for right of way through public lands for the purpose of irrigation by using the waters of the Rio Grande River or any of its tributaries in the State of Colorado or in the Territory of New Mexico until further instructions from you. The request of this Department, upon which your order was based, was made at the suggestion of Col. Anson Mills, a copy of whose letter, dated October 29, 1896, was transmitted to you October 31 of that year.

(Here the Secretary suggests modification of said order of suspension in so far as it applies to Pecos River.)

There is another phase of this question which it has occurred to me may have an important bearing upon the rights of parties now applying for permission to erect dams across the Rio Grande, and also upon the international question involved. I have information which indicates that the Rio Grande River in some parts above the international boundary line is and has been used as a waterway for navigation between the United States and Mexico, and possibly between the State of Colorado and the Territory of New Mexico. If it be true that this stream in its natural condition is capable of use for the transportation of commerce between two States of the Union, or between the United States and a foreign country, the river is a navigable water of the United States, and

as such subject to the laws of Congress enacted for the maintenance, protection, and preservation of the navigable waters of the United States. One of the principal matters of complaint by Mexico is that the diversion of the upper waters of the Rio Grande for irrigation purposes has affected the usefulness of that stream as a waterway for commerce.

114 The Attorney-General, in his opinion of December 12, 1895 (21 Op., 274), held that the river was not navigable above the boundary in the sense of the treaty between the United States and Mexico; but the question here is whether it is navigable within the meaning of the laws of the United States. The condition of navigability within the meaning of our statutes are well defined in the decisions of Federal courts. Many of these are referred to in 20 Op., 101.

If the Rio Grande River is in the part under consideration a navigable water of the United States, the question arises whether the erection of the proposed dam across it will not interfere with its navigability and bring these dams within the prohibition of the statute enacted for the preservation of navigable waters. I refer particularly to the act of September 19, 1890, secs. 7 and 10 (26 Stat., 426), and to the act of July 13, 1892, sec. 3 (27 Stat., 110). It is true that the enforcement of these statutes devolves primarily upon the Secretary of War, and that at first view it may not appear to be a part of the duty of the Secretary of the Interior to take care of the navigability of the streams on the public lands. But in a case where the act of the Secretary of the Interior approving the right of way to build a dam across the river on the public lands may operate—as it must if the river is a navigable water of the United States—as a grant of Executive sanction to a proceeding which is in violation of law, it would seem to be the duty and within the jurisdiction of the Secretary of the Interior to ascertain before sanctioning the erection of a dam whether it would constitute an obstruction to a navigable water of the United States and be within the prohibition of the statutes.

As the erection of the dams under consideration is now the subject-matter of a complaint of the Government of Mexico, I feel it my duty to lay this question before you, in order that you may determine, in the first place, whether you have the power, and, in the second place, whether it is a part of your duty to withhold approval of the pending applications for right of way to build dams across the Rio Grande River and its tributaries above the boundary line until the applicants have satisfied you that the river in the part affected by these dams is not a navigable water of the United States or that the dams will not interfere with the navigation of the river. It must be observed that the obstruction to navigation may result not only from the intervention of the dam across the river, but also from the diversion of the waters, leaving an insufficient quantity below the dam for the purposes of navigation.

I have the honor to be your obedient servant

RICHARD OLNEY.

United States of America, Territory of New Mexico, 3d judicial dist.
court.

Be it remembered that on the 24th day of May, A. D. 1897, there was entered of record in the United States district court of the third
115 judicial district of the Territory of New Mexico an order, which said order is in words and figures as follows, to wit:

UNITED STATES OF AMERICA	}	No. 140.
<i>vs.</i>		
THE RIO GRANDE DAM & IRRIGATION COMPANY.		

Upon the filing and reading of the bill of complaint in the foregoing cause, it is ordered that a temporary writ of injunction issue against the defendant, The Rio Grande Dam & Irrigation Company, as prayed for in said bill, and it is further ordered that said defendant show cause, if any it have, before me in chambers, on Monday, the 14th day of June, 1897, why said injunction should not be continued in force until the final hearing of the cause or should be dissolved.

Done in chambers this 24th day of May, A. D. 1897.

GIDEON D. BANTZ, *Judge, etc.*

And be it further remembered that afterwards, to wit, on the 25th day of June, A. D. 1897, in the said United States district court, the following proceedings were had and entered of record, to wit:

In the United States district court of the third judicial district of the Territory of New Mexico. In vacation. At chambers.

Present: Gideon D. Bantz, judge and chancellor; W. B. Childers, esq., United States attorney; W. B. Walton, clerk.

UNITED STATES OF AMERICA	}	No. 140. Chancery.
<i>vs.</i>		
THE RIO GRANDE DAM & IRRIGATION COM- pany et al.		

Comes now the United States of America, by W. B. Childers, esq., its district attorney, and with him by courtesy appearing T. A. Falvey, esq., and W. B. Brack, esq., in aid of the said district attorney.

And now comes W. A. Hawkins, esq., Albert B. Fall, esq., and S. B. Newcomb, esq., and enter their appearance as solicitors for the respondents herein.

And now this cause coming on to be heard upon the order to show cause why the temporary injunction heretofore granted herein should not be continued in force, heretofore made and entered of record in this cause, and respondents' motion to dissolve said injunction, heretofore filed herein, and the court having heard arguments of counsel, and this hearing not being concluded, it is continued until to-morrow morning at nine o'clock.

Now the court appoints H. B. Holt as special stenographer to the court for the hearing of this cause, and he is duly sworn to well and truly serve as such.

It is ordered that hearing adjourn until to-morrow morning at nine o'clock.

And be it further remembered that afterwards, to wit, on the 26th day of June, A. D. 1897, in the said United States district court, the following proceedings were had and entered of record, to wit:

116 Hearing resumed pursuant to adjournment, present and presiding as of yesterday.

UNITED STATES OF AMERICA	}	No. 140. Chancery.
<i>vs.</i>		
THE RIO GRANDE DAM & IRRIGATION Company et al.		

And now this cause coming on further to be heard upon the order to show cause why the temporary injunction heretofore granted herein should not be continued in force, made and entered of record in this cause, and respondents' motion to dissolve said injunction heretofore filed herein, and the court having heard arguments of counsel, and this hearing not being concluded, it is continued until Monday morning at nine o'clock.

It is ordered that hearing adjourn until Monday morning at nine o'clock.

And be it further remembered that afterwards, to wit, on the 28th day of June, A. D. 1897, in the said United States district court, the following proceedings were had and entered of record, to wit:

Hearing resumed pursuant to adjournment, present and presiding as of Saturday.

UNITED STATES OF AMERICA	}	No. 140. Chancery.
<i>vs.</i>		
THE RIO GRANDE DAM & IRRIGATION Company et al.		

And now this cause coming on further to be heard upon the order to show cause why the temporary injunction heretofore granted herein should not be continued in force, made and entered of record in this cause, and respondents' motion to dissolve said injunction heretofore filed herein, and the court having heard arguments of counsel, and this hearing not being concluded, it is continued until to-morrow morning at nine o'clock.

It is ordered that hearing adjourn until to-morrow morning at nine o'clock.

And be it further remembered that afterwards, to wit, on the 29th day of June, A. D. 1897, in the said United States district court, the following proceedings were had and entered of record, to wit:

Hearing resumed pursuant to adjournment, present and presiding as of yesterday.

UNITED STATES OF AMERICA	}	No. 140. Chancery.
<i>vs.</i>		
THE RIO GRANDE DAM & IRRIGATION Company et al.		

And now this cause coming on further to be heard upon the order to show cause why the temporary injunction heretofore granted herein

should not be continued in force, made and entered of record in this cause, and respondents' motion to dissolve said injunction heretofore filed herein, and the court having heard all the arguments of counsel, and this hearing being concluded, the court doth reserve his decision herein until a future date.

117 And be it further remembered that afterwards, to wit, on the 3rd day of July, A. D. 1897, there was entered of record in the said United States district court an order, which said order is in words and figures as follows, to wit:

In the district court of the third judicial district of the Territory of New Mexico—in vacation—at chambers.

UNITED STATES OF AMERICA	}	No. 140, Chancery.
<i>vs.</i>		
THE RIO GRANDE DAM & IRRIGATION COMPANY et al.		

And now this cause, coming on further to be heard on the order to show cause why the temporary injunction, heretofore granted herein, should not be continued in force, made and entered of record in this cause, and the motion to dissolve said injunction, heretofore filed herein; and the court having heretofore heard all the arguments of counsel, and being fully advised in the premises, doth sustain said motion.

It is therefore ordered by the court that the motion to dissolve the injunction, heretofore filed by respondents in this cause, be and the same is hereby sustained, and that the injunction, heretofore granted herein, be and the same is hereby dissolved.

GIDEON D. BANTZ,
Judge and Chancellor.

And be it further remembered that afterwards, to wit, on the 31st day of July, A. D. 1897, there was entered of record in the said United States district court, an order, which said order is in words and figures as follows, to wit:

In the district court of the third judicial district of the Territory of New Mexico, sitting for the trial of causes arising under the Constitution and laws of the United States.

UNITED STATES OF AMERICA, COMPLAINANT,	}	No. 140.
<i>vs.</i>		
RIO GRANDE DAM & IRRIGATION COMPANY et al., defendants.		

Order.

It is ordered by the court that the complainant, the United States of America, be, and it is hereby, permitted to file and make a part of the record in said cause, and that the same be considered as part thereof for the purpose of the hearing upon the rule heretofore made upon the defendant, The Rio Grande Dam & Irrigation Company, upon the filing of the

original bill in this cause, to show cause why an injunction, theretofore issued, should not be issued, the articles of incorporation of the said Rio Grande Dam & Irrigation Company, and a copy of an indenture of lease executed by and between the said Rio Grande Dam & Irrigation Company and its codefendant, The Rio Grande Dam, Irrigation, and Land Company, Limited, and the said exhibits, when so filed, be considered and taken as a part of the record considered by the court upon the hearing of said rule upon said injunction, and that said exhibits be considered as filed nunc pro tunc of date the 25th day of June, A. D. 1897.

GIDEON D. BANTZ, *Judge*.

And be it further remembered that afterwards, to wit, on the 31st day of July, A. D. 1897, there was entered of record in the said United States district court an order, which said order is in words and figures as follows, to wit:

In the district court of the third judicial district of the Territory of New Mexico, sitting for the trial of causes arising under the Constitution and laws of the United States.

UNITED STATES OF AMERICA, COMPLAINANT,	} No. 140.
<i>vs.</i>	
RIO GRANDE DAM AND IRRIGATION COMPANY et al., defendants.	

Order.

And now this cause coming on to be heard, The United States of America, appearing by its attorney for the Territory of New Mexico, W. B. Childers, esq., and with him appearing, by courtesy, T. A. Falvey and W. B. Brack, esq., of El Paso, Texas, and the defendant, The Rio Grande Dam & Irrigation Company and The Rio Grande Irrigation and Land Company, Limited, by their solicitors, W. A. Hawkins, S. B. Newcomb, and A. B. Falls, esqrs., under the rule heretofore made upon the defendant, Rio Grande Dam and Irrigation Company, to show cause, if any it had, why the injunction, heretofore granted, restraining it from maintaining and erecting a dam in the Rio Grande River at a point called Elephant Butte, fully described in the original and amended bills, filed herein and in said order, should not be continued; and the said complainant, The United States of America, having filed an amended bill in said cause, making the Rio Grande Irrigation and Land Company, Limited, a party thereunder; and the said defendant, in answer to said amended bill, having filed a special plea in bar, and having also answered said amended bill and also filed a motion to dissolve the injunction and to dismiss the original and amended bills so filed by complainant herein, and the complainant thereupon having filed its motion to set down defendants' pleas for argument as to their sufficiency as defense to said suit as a matter of law, and the court having heard the arguments of counsel and having heard read the affidavits, extracts from geological reports, agricultural reports, reports of engineers and of the Secretary of War,

histories and other sources of information, and having had submitted to it official map of the Territory of New Mexico and of the United States of America, showing the source, trend, course, and mouth of the
 119 Rio Grande River in New Mexico and throughout the United States and being fully advised thereby, doth take judicial notice of the fact, and doth thereby determine that the Rio Grande River is not navigable within the Territory of New Mexico, and doth find as a matter of law that said amended bill does not state a case entitling the complainant to the relief asked for in the prayer of said amended bill, and that the same is without equity, and the complainant having further declined to amended said bill:

The court doth order, adjudged, and decree, that the said injunction, heretofore issued, herein be dissolved and that said cause be, and the same hereby is, dismissed, and that the defendants have and recover their reasonable costs herein to be taxed against complainant.

And upon the complainant, the United States, in said cause praying an appeal from the order of the court, dismissing said cause, it is ordered that said appeal be and the same hereby is granted as prayed.

GIDEON D. BANTZ,
Judge and Chancellor.

Done at chambers this the 30th day of July, A. D., 1897.

UNITED STATES OF AMERICA,
Territory of New Mexico, Third Judicial District Court.

I, W. B. Walton, clerk of the United States district court of the Territory of New Mexico, do hereby certify that the above and foregoing is a true and correct copy of all the record entries in cause number 140 on the docket of said court, wherein the United States of America is complainant and The Rio Grande Dam & Irrigation Company et al. are defendants, as the same appear of record in my office.

Witness my hand and the seal of said court, at Silver City, New Mexico, this twelfth day of August, A. D., 1897.

[SEAL.]

W. B. WALTON, *Clerk.*

In the district court, third judicial district.

THE UNITED STATES OF AMERICA	}	No. 140. Injunction.
<i>vs.</i>		
THE RIO GRANDE DAM & IRRIGATION Company et al.		

Syllabus of opinion.

(1) Under the treaties with Mexico each Republic reserves all right within its own Territorial limits. This would have been so upon principles of international law without such reservation. States lying wholly within the United States belong exclusively to it, and the soil within the United States is not burdened with a servitude in favor of Mexico, in respect to any duty to so discharge the water as to promote or preserve the navigability of the Rio Grande.

(2) It is not the capacity of a stream to float a log or a rowboat which renders it a navigable river within the acts of Congress (1890 and 1892), but whether, at regular periods of sufficient duration and in its regular condition, its capacity is such as to be susceptible of beneficial use as a public highway for commerce. The Rio Grande in New Mexico is not a navigable river.

(3) The power to control and regulate the use of waters not navigable, exercised by States and Territories in the arid west, was confirmed by Congress by the act of 1866, and that power now resides wholly in such States and Territories under the act of 1877, and subsequently, therefore, the diversion of such local waters is not a violation of any act of Congress, even though the navigable capacity at a distance below may become thereby impaired.

UNITED STATES OF AMERICA	}	No. 140. Injunction.
<i>vs.</i>		
THE RIO GRANDE DAM & IRRIGATION Company et al.		

Opinion of the court.

The issues, briefly stated, are these:

The amended bill charges that the defendant is, (1) about to obstruct the Rio Grande, a navigable river, and, (2) obstruct the flow of waters and interfere with the navigable capacity of a river. That such obstructions would be in violation of the acts of Congress of 1890 and 1892, and contrary to the treaty with Mexico.

A preliminary injunction was granted and the defendant ordered to show cause why it should not be continued. The defendant filed its answer denying that the Rio Grande is a navigable river; and also filed special pleas justifying under right of way for reservoir and canals secured under the acts of 1891 and certain Territorial laws.

The issues arise on the motion to dissolve the injunction and upon the sufficiency of the special pleas.

It may be stated at the outset that this is not a contest between private persons as to superior right by prior appropriation. When that question arises, the courts will doubtless be entirely competent to deal with it.

The Rio Grande from El Paso to the Gulf of Mexico is the boundary line between Mexico and the United States, and under treaty between those Republics the Rio Grande along such boundary is made free and common to the vessels and citizens of both countries. There is no guaranty by either Republic that the Rio Grande is or will continue to be navigable, but each party stipulated that it would not construct any work "below the intersection of the 31 degree, 47 min., 30 sec. parallel of latitude with the boundary line" which may impede or interrupt in whole or in part the exercise of the free and common use of the river. Neither Mexico nor the United States surrendered any proprietary right to the adjacent soil or to any incident thereof. Indeed, it is expressly stipulated that the treaty shall not "impaired the territorial rights of either Republic within its established limits."

121 The legal effect would have been the same had the reserving clause been omitted, as under the proper rule of construction the

free and unobstructed passage is ceded without prejudice to other territorial rights. The continued enjoyment of other proprietary rights must be presumed unless expressly renounced. Vattel, *Law Nations*, sec. 273.

The territory of the United States includes the lakes, seas, and rivers lying within its limits; hence rivers flowing through it form part of its domain and can not be considered as free to other countries any more than the adjacent lands.

An exception to this general rule has been sometimes claimed, where the river flows from one State through the territory of another, in favor of the right of passage to and from the inland State for commercial and other peaceful purposes. While this exception has been sometimes contested (ex. gr., by Spain over the Mississippi, Great Britain over the St. Lawrence, Holland over the Scheldt) it is at best regarded as an imperfect right subservient to the convenience and safety of the state affected. Wheaton, *International Law*, 188-205; Polson, *Law Nations*, 30.

It therefore seems clear that there is no duty created by international law or by treaty which requires that the waters collected along the Rio Grande and lying wholly within the United States shall be so discharged as to aid in the navigation of the Rio Grande along the Mexican boundary; and the diversion of waters lying wholly within the United States is not a violation of any treaty rights secured by Mexico. If it were otherwise the secondary and dependent right of navigation would absorb the superior and primary territorial rights of the United States over its own domain, and subject lands wholly within the limits of this Republic to the burdens of a servitude not expressed in the treaty or implied from any reasonable interpretation of its language.

This brings us to a consideration of the question as to whether the Rio Grande is a navigable river in New Mexico, and at the point known as Elephant Butte, within the meaning of the acts of Congress of 1890 and 1892.

Counsel on each side of this case concede that the court takes judicial notice of what are navigable rivers, but for the enlightenment of the court in this matter a great mass of documentary information has been submitted in the shape of maps, reports of exploring and surveying expeditions made under the War and Interior Departments of the Government, and also reports of officers specially detailed to investigate the feasibility of utilizing the river for navigation and its capabilities for reservoirs and irrigation.

It will be observed that in the original bill it was not charged that the Rio Grande is a navigable river above El Paso, but charged that the river is navigable below El Paso, and that defendants' proposed
122 dam (125 miles above) will destroy the river as a stream, diminish the volume of water below, and materially affect its navigability. The amended bill charges that the river is navigable up as far as Roma, a short distance above the Gulf of Mexico, and is susceptible of navigation and has been navigated from Roma to a point 150 miles below El Paso (Presidio del Norte), where the falls and rapids interrupt navigation, and that the river above the falls is susceptible of navigation up to La Joya, above Elephant Butte; the bill closes this part with an allegation that the river is navigable and susceptible of being navigated as aforesaid, for carrying on commerce between the

Territory of New Mexico, the State of Texas, and the Republic of Mexico.

The course of the Rio Grande in Mexico is through rocky cañons and sandy valleys; in the valleys it spreads out, shallow and between low banks; over fine, light, sandy soil of great depth; bars are continually forming, passing away and re-forming, and the quicksands in the bed of the stream and along its margin are perilous to life. The fall is from four to fifty-two feet to the mile and the changes in its course are rapid, continual, and often radical; the valley is scarred with low ravines made by its progress in different places. In all the period of time only two instances were shown where the river was actually utilized for the conveyance of merchandise, and these were of timbers; one of these instances occurred in 1858 or 1859, when a raft was sent down from Camutillo to El Paso, a distance of 12 miles; and the other recently, when some telegraph poles were floated from La Joya a "short distance." "The water of the stream, especially in central and southern New Mexico, is heavily loaded with silt. The channel of the river through these valleys is usually choked with sand and in times of low water the stream divided into a number of minor channels; and apparently a large percentage of the water is lost in these great deposits of fine material." (12 Annual Rept. Geol. Sur., 204.) "From Bernalillo (N. M.) to Fort Hancock (Tex.) the Rio Grande is in the highest degree spasmodic, with immense floods during a few weeks of the year and a small stream during the remainder of it." (10 Annual Rept. Geol. Sur., p. 99.) "From personal observation, I know that these seasons of flood and drouth (in Rio Grande) were of about the same character 30 years ago." (Maj. Anson Mills, 10 U. S. Cav., Rept. Spec. Com. Sen., vols. 3 and 4, p. 39.) But what is of more importance, we have reports of officials upon the exploration of the river made under the direction of the Government for the special purpose of considering its navigability. From these it appears: "The stream is not now navigable, and it cannot be made so by open channel improvement. An accurate survey and hydrometric observations would be necessary to determine positively whether an improvement by locks and dams could be made or not, but the heavy fall of the river, the low-
123 ness of its banks and the small discharge, do not encourage the belief that such improvement would be financially, even if physically, practicable. Certainly there is no public interest which would justify the expenditure of the many millions of dollars which such an improvement would involve. The irrigation of the valley is a matter in which the inhabitants are now deeply interested, while the possible navigation of the river receives little or no attention from them. * * * In my judgment the stream is not worthy of improvement by the General Government." (Report of O. H. Ernst, major of engineers, to Secretary of War, 1889.) Again, "I consider the construction, not only of an open river channel, but of any navigable channel, to be impracticable. * * * During the greater part of the year when the river is low, the discharge would be insufficient to supply any navigable channel, except perhaps a narrow canal with locks, the construction of which, on a foundation of sand in places forty feet deep, would be financially, if not physically, impracticable." (Report of Gerald Bagnall, assistant engineer, to Secretary of War, 1889.)

The navigability of a river does not depend upon its susceptibility of being so improved by high engineering skill and the expenditures of vast sums of money, but upon its natural present conditions. In *Daniel Ball*, 10 Wallace, 557, the Supreme Court says: "Those rivers must be regarded as public navigable rivers in law which are navigable in fact, and they are navigable in fact when they are used or are susceptible of being used in the ordinary condition, as highways for commerce over which trade and travel are or may be conducted in the customary modes of trade and travel on water." In the *Montillo*, 20 Wallace, 431, the court says: "If it be capable in its natural state of being used for purposes of commerce, no matter in what mode that commerce may be conducted, it is navigable in fact and becomes a public river or highway * * * the vital and essential point is whether the natural navigation of the river is such that it affords a channel for useful commerce." The court approves the language of Chief Justice Shaw in 21 Pickering, 344, who said: "In order to give it the character of a navigable stream it must be generally and commonly useful to some trade or agriculture." See also *Morrison vs. Coleman* (Ala.), 3 L. R. A., 334. Of course it need not be perennially navigable, but the seasons of navigability must occur regularly and be of sufficient duration and character to subserve a useful public purpose for commercial intercourse. While the capacity of a stream for floating logs or even thin boards may be considered, yet the essential quality is that the capacity should be such as to subserve a useful public purpose. (Angell, *Water Courses*, 335.) In a recent case the supreme court of Oregon says, per Thayer, C. J.: "Whether the creek in question is navigable or not for the purposes for which appellant used it, depends upon its capacity in a natural state to float logs and timber, and whether its use for that purpose will be
124 an advantage to the public. If its location is such and its length and capacity so limited that it will only accommodate but a few persons, it cannot be considered a navigable stream for any purpose. It must be so situated, and have such length and capacity, as will enable it to accommodate the public generally as a means of transportation." And in the same case Lord, J., said: "It must be susceptible of beneficial use to the public," be "capable of such floatage as is of practical utility and benefit to the public as a highway." And of the stream then in question he says: "It is not only not adapted to public use, but the public have made no attempt to use it for any purpose." (*Haines vs. Hall* (Oregon), 3 L. R. A., 609.) The supreme court of Alabama says: "In determining the character of a stream, inquiry should be made as to the following points: Whether it be fitted for valuable floatage; whether the public or only a few individuals are interested in transportation; whether any great public interests are involved in the use of it for transportation; whether the periods of its capacity for floatage are sufficiently long to make it susceptible of use, beneficially to the public." (*Roads vs. Otis*, 33 Ala., 578; *Peters vs. N. O. M. & C. R. Co.*, 56 Ala., 523.) Indeed in the letter of inquiry by the honorable Richard Olney, Secretary of State, in respect to the facts as to the navigability of the Rio Grande in interstate commerce, among other essential qualities, he says: "It should be remembered, that a mere capacity to float a log or a boat, will not alone make a river navigable. The question is, whether the river

can be used profitably for merchandise. I have been informed that wood is sometimes brought down the river to Ciudad Juarez in flatboats, and that logs are rafted or floated down from the timbered lands on the upper river for commercial purposes." (Letter January 4, 1897.) The Secretary of State seems to have been misinformed as to such use for commerce. This letter was addressed to Col. Anson Mills, at whose request it appears that applications for right of way for irrigation, by the use of waters of the Rio Grande, and all its tributaries, were suspended throughout New Mexico and Colorado. The answer of Col. Mills deals almost wholly with the river internationally; the river in its relation to interstate commerce is dismissed by him, with an instance of the floating of a raft of logs in 1859, from a point 18 miles above El Paso, and the qualifying remark "it would now hardly be practicable to do so." (Letter January 7, 1897.)

The fact that dams have been erected across the river at El Paso and other places, from the earliest times, and the fact that no use has been made of the stream for navigation or floatage, are facts which though they do not in themselves determine its susceptibility of navigation, are nevertheless entitled to great weight. They are facts clearly indicating the common judgment and knowledge of the people who have had the longest and most intimate acquaintance with the capabilities of the river; a knowledge founded on their own experience and that of their ancestors.

The Rio Grande is not a navigable river in New Mexico.

The next point is that, even though the Rio Grande be not navigable in New Mexico, still the contemplated obstruction will diminish the waters and thereby impair the navigability of the river at points several hundred miles below, near its mouth at the Gulf, and that therefore it is an obstruction within the meaning of the act of 1890. Counsel for defendant raise the point that the undisputed fact is that a dam has been maintained for near two hundred years across the river at El Paso by which the waters of the Rio Grande are diverted into irrigating ditches in the city of El Paso and upon Mexican soil; and that in a proceeding in equity a chancellor cannot close his eyes to the fact that apparently some other purpose than navigation is the real object of this proceeding. If, however, the threatened act of the defendant be illegal I cannot agree that the Government becomes powerless to resist it, merely because others are engaged in like enterprises.

We will therefore consider the question whether the contemplated obstruction at Elephant Butte will be an illegal interference with the navigability of the river several hundred miles below toward the Gulf. The act of 1890 (1 Sup. R. S., p. 803) prohibits the creation of obstructions "not affirmatively authorized by law" to the "navigable capacity" of any waters of the United States. Its terms are more comprehensive than the act of July 13th, 1893, prohibiting the erections of dams, etc., etc., in any navigable river without the permission of the Secretary of War. It is contended that under the act of 1890 an obstruction, no matter where placed, is unlawful which diverts waters from flowing into a navigable river and thereby affects the navigable capacity of such a river. But a careful reading of the act will not, I think, sustain the contention. The act applies only to obstructions to waters of which the United States

has jurisdiction, and then only to the navigable capacity of such waters. The language is, "The creation of any obstruction, not affirmatively authorized by law, to the navigable capacity of any waters in respect of which the United States has jurisdiction, is hereby prohibited." Waters which are not navigable are local and subject to local laws. The jurisdiction of Congress over waters arises from the power to regulate commerce between the States and foreign nations. (*Veazie vs. Moor*, 14 *Hew.*, 568; *Gould, Waters*, 34.) Unless, therefore, the stream is navigable and a means of communication between the States and foreign nations Congress is utterly without jurisdiction over it, except in respect of its riparian rights arising from the ownership of the soil through which such waters run.

We might close the opinion at this point, but the important interests and questions involved in this cause perhaps require a more extended consideration.

126 The riparian rights of the United States were surrendered in 1866 (*R. S.*, 2339). Prior to that time it had become established that the common-law doctrine of riparian rights was unfitted to the conditions in the far West, and new rules had grown up under local legislation and customs more nearly analogous to the civil law. Recognizing that the public domain could not be utilized for agriculture and mining purposes without the use of water applied by artificial means, and that vast interests had grown up under the presumed license of the Federal Government to the use of such waters, Congress confirmed the rights of prior appropriation of waters by the act above mentioned, where the same "are recognized and acknowledge' by the local customs, laws, and decisions of the courts." (*Sec.* 2339.) The Supreme Court of the United States, in passing upon this act, observes: "It is evident that Congress intended, although the language used is not happy, to recognize as valid the customary law with respect to the use of the water which had grown up among the occupants of the public lands under the peculiar necessities of their condition." (*Atchison vs. Peterson*, 20 *Wal.*, 507; *Basey vs. Gallagher*, 20 *Wal.*, 671.) And since 1870 patents for lands expressly except vested water rights.

Of course, Congress may resume its control, but there can be no presumption of an intent to take them out of local control and resume regulative power from doubtful expression. Repeals by implication are not so favored. Congress could undoubtedly preserve navigable streams by legislating against the use of their confluence. But that power could not be exercised against those private rights which have become vested, unless under the power of eminent domain compensation be paid therefor.

Instead of an intention to resume such control Congress has manifested a purpose to extend the largest liberty of use of waters in the reclamation of the arid region, and under local regulative control. Following in line with the act of 1866 the act of 1877 authorize' the entry of desert lands in the arid region by those who intend to reclaim them by conducting water upon them. This act again distinctly recognized the validity of the right of prior appropriation, and also provided that "All surplus water over and above such actual appropriation and use, together with the water of all lakes, rivers, and other sources of water supply upon the public lands and not navigable, shall remain and be

held free for the appropriation and use of the public for irrigation, mining, and manufacturing purposes, subject to existing rights." This act was limited to States and Territories in the arid region. (1 Sup. R. S. P., 137.) Colorado was included in 1891. (1 Sup. R. S., 249-41.) By the act of 1888 (an appropriation bill) an investigation was directed as to the extent to which the arid region might be redeemed by irrigation; it

provided for the selection of sites for reservoirs for the storage and
 127 utilization of water for irrigation and the prevention of overflows,
 and that the lands designated for reservoirs, ditches, or canals,
 and all lands susceptible for irrigation therefrom be reserved from sale or entry. (1 Sup. R. S., 698.) In 1890 the reservation from sale or entry of lands, except as to reservoir sites, was repealed; reservoir sites remained segregated. (1 Sup. R. S., 791-792.) In the same year it was provided that patents for lands west of the 100th meridian should reserve the right of way for ditches and canals. (1 Sup. R. S., 792.) In 1892 public lands were opened to private location for the right of way to the extent of the ground occupied by the water of the reservoir, canals, and laterals and fifty [feet] on the margin. In this act it was provided that "the privilege herein granted shall not be construed to interfere with the control of the water for irrigation and other purposes under authority of the respective States or Territories." (1 Sup. R. S., 946.) On the 26th day of February, 1897, Congress opened the reservoir sites, reserved by the Government under the act of 1891, to private location, and the local legislators were authorized to prescribe rules and regulations and fix water charges.

From these acts two things are manifest—that (1) the use of the water for irrigation purposes was authorized, and (2) that the local laws should govern the use of that water for such purposes. In harmony with this use the Interior Department holds that in granting the right of way for reservoirs and canals it does not and can not assume to determine or prescribe water rights, and that the flow and the use of the water is a matter exclusively under State or Territorial control. (Decision Interior Department, vol. 18, p. 168.)

"The region in which agriculture depends on irrigation includes about four-tenths of the entire area of the United States, not including Alaska." (Report of Director of Geological Survey to Secretary of Interior, March 13, 1888.) Throughout the vast tract classed as the arid region extending west from about the 100th parallel there is little or no use for water for navigation, but the cultivation of millions of acres of land is necessarily dependent upon the use of it. The authority to grant permission to divert waters for such purpose is not given to the Secretary of War, neither is it given to anyone else. Yet if such water can not be diverted, millions of acres now in cultivation must be turned back, a waste country, or the cultivation continued in violation of law, civil and criminal. These may be said to be considerations of policy with which the courts have nothing to do. If the law be clear, this is undoubtedly true, and the courts must administer it; but in ascertaining what the law is we can not refrain from examining the path we are invited to pursue. The hardships and inconveniences which would result, not simply in an individual case, but from the establishment of a rule, is an argument against

it. And, after all, there is much soundness in the observation of
 128 one of the foremost of American jurists, that the growth of the
 law is in truth legislative. "The very considerations which judges
 most rarely mention, and always with an apology, are the secret root from
 which the law draws all the juices of life. I mean, of course, considera-
 tions of what is expedient for the community concerned. Every
 important principle which is developed by litigation is in fact and at
 bottom the result of more or less definitely understood views of public
 policy: most generally, to be sure, under our practice and traditions, the
 unconscious result of instinctive preferences and inarticulate convictions,
 but none the less traceable to views of public policy in the last analysis."
 (Holmes' *Com. Law*, Lec. 1, p. 35.) The *Genesee* Chief case is an illus-
 tration of this. There the court disregarded the arbitrary distinction in
 respect to the ebb and flow of the tide suitable to conditions in England,
 and which had been followed in the earlier cases in the United States,
 and it was held that the admiralty and maritime jurisdiction of the United
 States extended to the great lakes and rivers without limit as to the tide,
 and that this jurisdiction was not founded upon the clauses of the Con-
 stitution in respect to regulating commerce, but solely by virtue of its
 admiralty and maritime power. The English rule was appropriate
 enough until the application of steam power to navigation opened the
 great rivers to commerce. (12th How., 450.)

Considering the discussion in Congress, the reports of committees, and
 the labors and reports of officials in the Interior and War Departments,
 made under Congressional directions, it seems quite manifest that the
 purpose by the Federal Government to hold and further redeem the great
 arid region had become the recognized policy and the measure of the
 highest public importance and necessity. It would seem that at first it
 was the design to establish and maintain an elaborate system of irriga-
 tion at public expense, but the immense cost of such an enterprise seems
 to have induced its abandonment, temporarily, at least, and in its stead
 another system has been provided by irrigation at private cost. The
 system may be incomplete in many of its details, but such as it is reser-
 voir sites have been located, surveyed, and established along the streams
 navigable and nonnavigable, under the immediate direction of govern-
 ment officials and by authority of Congress, and the right to make private
 entries of others under the supervision of the Secretary of the Interior
 is also authorized.

Ruins of extensive irrigation systems scattered all over New Mexico
 and Arizona of a prehistoric people show that conditions which have con-
 fronted the present age were conditions encountered in the remote past
 and apparently overcome. The cultivation of the Rio Grande Valley by
 acequias from the river is mentioned by the earliest of Spanish priests
 and explorers, and is established by authentic historical memorials
 extending back more than two centuries. The law of prior appro-
 129 priation existed under the Mexican Republic at the time of
 the acquisition of New Mexico, and one of the first acts of this
 Government was to declare that "the laws heretofore in force concerning
 water courses * * * shall continue in force." Code proclaimed by
 Brigadier-General Kerney September 22nd, 1846. One of the first acts
 of the local legislature (1852), after the organization of the Territory,

provided that "All rivers and streams of water in this Territory, formerly known as public ditches or acequias, are hereby established and declared to be public ditches or acequias." (Com. Laws, sec. 6.) In 1874 it was provided that "All of the inhabitants of the Territory of New Mexico shall have the right to construct either private or common acequias, and to take the water for said acequias from wherever they can, with the distinct understanding to pay the owner through whose lands said acequias have to pass a just compensation for the land used." (C. L., sec. 17.) In 1887 an act was passed giving authority to corporations to construct reservoirs and canals, and for this purpose to take and divert the water of any stream, lake, or spring, provided it does not interfere with prior appropriations. (Session Acts, 1887, chap. 12.) Other acts have passed since upon the subject in regard to the acquisition of water rights. But this legislation is not peculiar to New Mexico; its general characteristics are common throughout the West, where the doctrine of prior appropriation prevails. This was the character of local legislation which Congress recognized, confirmed, and authorized by the various acts to which reference has been made. As an indication of the scarcity of the supply and of the great value attached to water, one of the early acts of the legislature prohibited the making of paths across the fields, as they were calculated to divert the flow of the water and injure acequias. The doctrine of prior appropriation has been the settled law of this Territory by legislation, custom, and judicial decision. Indeed, it is no figure of speech to say that agriculture and mining life of the whole country depends upon the use of the waters for irrigation, and if rights can be acquired in waters not navigable, none can have greater antiquity and equity in their favor than those which have been acquired in the Rio Grande Valley in New Mexico.

Therefore the diversion of such local waters is not a violation of any act of Congress, even though the navigable capacity of the river at a distance below may become thereby impaired.

In conclusion, it is therefore held that the Rio Grande is not a navigable river above El Paso, and that the waters thereof are local waters under local control by the authority of Congress, and that their interruption and diversion is not a violation of any law of the United States or any treaty. In this view of the case it appears that the bill as amended is without equity, and the injunction heretofore granted should be dissolved. It will be unnecessary to decide whether the waters of a navigable river may be diverted, as that issue does not arise in this case. As the bill is without equity, other questions which have been raised need not be considered.

GIDEON D. BANTZ,
Judge and Chancellor.

UNITED STATES OF AMERICA,
Territory of New Mexico, Third Judicial District Court.

I, W. B. Walton, clerk of the United States district court of the third judicial district of the Territory of New Mexico, do hereby certify that the foregoing and attached files are all of the original papers filed in my office in cause numbered 140 on the docket of said court, wherein the United States of America is complainant and The Rio Grande Dam & Irrigation Company et al., are defendants.

Witness my hand and the seal of said court, at Silver City, New Mexico, this thirteenth day of August, A. D. 1897.

[SEAL.]

W. B. WALTON, *Clerk*.

APPENDIX.

THE STATE OF TEXAS,)
County of Cameron.)

Before me, Emilio C. Forto, a notary public in and for said county and State, on this day appeared William Kelly, who, after being by me duly sworn, on oath, deposes and says:

My personal experience in steamboating on the Rio Grande began in July, 1865, when I was serving as depot quartermaster at Brazos Santiago, Texas, and had charge of transportation for supplying the forces of General Fred Steele (then commanding the army of the Rio Grande), occupying the river between its mouth and Laredo. Since then I have been continuously engaged in steamboating on this river either as manager or owner.

Since 1865 I have been an interested observer of the changes in the volume of water coming down the Rio Grande, as affecting its navigation, and having had from time to time in my employment captains, pilots, mates, engineers, and other boatmen who had served on the river in their several capacities during and since the Mexican war (1846-8), I became familiar with its history from that date.

My personal observation has shown me that from 1865 to about 1880 there was little or no change in the average depth of navigable water between Roma and the mouth of the river. Since 1880 the volume of water has steadily decreased, and at present the river is not navigable above Brownsville for boats drawing over 30 inches of water or having more than twenty-four feet beam, for more than four months of the year and the channel between Brownsville and the mouth is very little, if anything, better.

From 1865 to 1874 steamboats of 200 to 250 tons, drawing from five feet to five feet and six inches, ran from the mouth of the river to Brownsville all the year round. During the same period we ran boats drawing four feet to Rio Grande City, Camargo, Roma, and Mier.

In 1874-5 the navigation between Brownsville and the mouth by steamboats was abandoned in consequence of the building of a narrow-gauge railroad from Brownsville to the Gulf, at Pt. Isabel (Brazos Santiago). From 1875 to date, I have kept boats running above Brownsville.

In 1880, we ceased to run above Rio Grande City, on account of shoaling water, and since that date no steamboat, except on a few occasions during freshets, has gone above that point. In 1885, I found that the river was permanently shoaling, and it was necessary to get a much smaller boat of lighter draft. The boat (the iron steamboat "Bessie" 100 tons) running to Rio Grande City at present, does not load to over 28 inches, and can only run to that point six or seven months in the year.

All steamboat men and others familiar with this river, with whom I have discussed the question, agree that chief cause of the decreasing water in the lower Rio Grande, is the fact that the annual and semi-annual freshets

from the headwaters of the stream no longer reach here in consequence of their being diverted for irrigation and other purposes. The confluent of the Rio Grande in Mexico and Texas (except the Pecos) are small, and only supply water to the main stream spasmodically by freshets, seldom lasting over two or three days, and more frequently not so many hours. The steady supply came from the Rio Grande above El Paso, and that being cut off, or so seriously diminished, has not only destroyed the navigability of the lower river, but has turned tens of thousands of acres of heretofore cultivated and cultivable lands into arid wastes, for want of the flooding they used to receive from the headwaters twice every year.

The average rainfall at Brownsville and Rio Grande City (I have no data from points above) has not materially decreased in the last twenty years. The hospital records at Fort Brown show the mean for ten years, from 1871 to 1880, to have been 23.26 inches; from 1880 to 1890 to have been 24.32—the annual minimum during that period having been 17.19 inches in 1875, and the max. 30.14 in 1882. While we have had a period of drought for the four years previous to July, 1896, the shortage of rainfall has been during the spring and summer—the winter rains have been about normal. This shows that the decreasing volume of water in the lower Rio Grande is not due to local causes.

The freshets coming from the Rio Grande above El Paso, previous to 1880, kept the lower river in good boating order all year, and old boatmen would say of rises in the stream, "That is El Paso water," or "that is Pecos water," or "that is San Juan water," basing their judgment on the color of the water and character of the drift. For several years I have not heard anyone at Brownsville say, "that is El Paso water," meaning water coming from above El Paso.

It is quite clear to me that any further diminution of the supply coming from above El Paso, by dam or otherwise, will, in the course of a short time, render the lower Rio Grande unnavigable. I have no doubt that with the volume of water we had previous to 1880 the river could with comparatively little expense (chiefly in removing the rocks that cause the rapids near Guerrerro) be made navigable for boats drawing four feet of water as high up as Laredo. Above that point I have no personal knowledge.

(Signed)

WILLIAM KELLY.

Sworn to and subscribed before me, by William Kelly, on this the 20th day of July, 1897.

[SEAL.]

(Signed)

EMILIO C. FORTO,

Notary Public in and for Cameron County, Texas.

[Copy.]

And be it further remembered, that on the 21st day of December, 1899, there was also filed in said clerk's office a request for findings

of fact, by the plaintiff in said cause, which said findings of fact are as follows:

In the district court of the Third judicial district of the Territory of New Mexico,

UNITED STATES OF AMERICA, PLAINTIFF,	} No. 1243.
<i>vs.</i>	
RIO GRANDE DAM AND IRRIGATION COMPANY et al., defendants.	

The plaintiff asks the court to make the following findings of fact:

I.

That the increased use of water for irrigation purposes in the State of Colorado per annum, during the last nineteen years, has diminished the mean flow of the Rio Grande at El Paso at least 1,000 second-feet per day for 100 days during the irrigation season, or 200,000 acre-feet in all, during each year.

II.

That since the commencement and use of water for irrigation in the State of Colorado, the evidence in the case shows a steady decline in the navigable capacity of the Rio Grande from Rio Grande City to Brownsville, both in the State of Texas, so that now the said river for a considerable portion of the year is not susceptible of navigation, and is almost at all times attended with much difficulty.

III.

That during a portion of the past ten years, and especially during the years from 1881 until 1894, both inclusive, a severe drouth has occurred in western Texas, near the vicinity of Rio Grande City, at the head of navigation, which has had considerable effect upon the navigable capacity of said stream within its navigable limits.

IV.

That there is no evidence from which the court can estimate the extent, or that has been any permanent change in the amount of rainfall in said region, or as to the amount of such effect since the commencement of this suit in May, 1897.

V.

That as a matter of law and fact, the Rio Grande is navigable from Brownsville to Rio Grande City, both in the State of Texas, a distance of 177 miles.

VI.

That from the undisputed evidence in the case, it appears that the river was navigated in a common rowboat, drawing about six inches of water, during the winter season of 1893-1894, from El Paso, Texas, to the mouth of the Rio Concho, at Presidio del Norte, Mexico, a distance estimated at 400 miles by the sinuosities of the stream, at a low stage of

water from 3 to $3\frac{1}{2}$ feet in depth at El Paso, Texas; said trip occupying 21 days, and without finding any obstructions in said stream.

That after remaining a period of 18 days in the vicinity of Presidio del Norte, the party making said trip embarked upon water said to have been furnished from the Rio Concho, a tributary of the Rio Grande, falling into the same from Mexico, and continued to Del Rio, Texas, a distance of 562 miles by the sinuosities of the stream.

VII.

That there is no evidence in the case going to show that there is any obstruction to the free and uninterrupted flow of the Rio Grande from Del Rio, Texas, to Rio Grande City, Texas.

VIII.

That there is no evidence in the case tending to show that water which has reached Del Rio, Texas, would not uninterruptedly continue to flow to Rio Grande City, Texas.

IX.

That at a point where the Rio Concho falls into the Rio Grande at Presidio del Norte, Mexico, the undisputed evidence in the case shows that the banks of the Rio Grande above the mouth of said Concho River, would accomodate a flow of 3,250 cubic feet of water per second without overflow.

X.

That said Concho River enters the Rio Grande from the Mexican side at nearly right angles from the Mexican side of the Rio Grande; that in the lower or southerly side of the Concho there is elevated ground upon which is situated the village of Presidio del Norte; that on the upper or northerly side of said Concho and on the westerly or Mexican bank of the Rio Grande the land is low, and the undisputed evidence shows that the same is subject to much overflow; that on the American side of the Rio Grande, at the mouth of the Concho, the banks are high and not subject to overflow.

XI.

That records were kept of the flow of water passing El Paso, Texas, for a part of the year 1889, and for the year 1890, 1891, 1892, 1897, and 1898, and a part of the year 1899; that no records were kept for any other years, which said record so kept show the amount of water passing El Paso for said years, respectively, to be as follows, viz:

From May 1 to Dec. 1, 1889	370,000	acre-feet
1890	971,000	" "
1891	1,943,000	" "
1892	941,000	" "
1893, Jan'y 1 to July 1	329,000	" "
1897	1,369,000	" "
1898	689,000	" "
From Jan. 1, 1899, to Sept. 30, 1899	70,000	" "

The river, after having been dry, commenced to run about Dec. 10, 1899.

XII.

The undisputed evidence in the case shows that certain cross sections were taken by a member of the International (Water) Boundary Commission at a certain point one mile below Rio Grande City, Texas, which indicates such cross section was taken as appears from the following table:

Estimated flow of Rio Grande one mile below Rio Grande City, Texas. Conditions assumed: River at low water, sudden rise comes, rising 1 ft. in 4 hours at first, and going on up to high water.

Stage of river.	C. sec. sq. ft.	Fall.	Current.	Flow sec. ft.	Add % for possible scour.	Max. flow sec. ft.	Added water for rise.	
Low water	1,226	1:7000	1.63 ft. sec ..	1,998	.....	1,998	343 s. f.	1,655 s. f. at l. w.
1 ft. rise	1,591	1:6950	1.90 " "	3,023	1%	3,053	1,398 "	
2 "	1,971	1:6900	2.14 " "	4,218	2%	4,302	2,617 "	
3 "	2,363	1:6850	2.40 " "	5,671	3%	5,841	4,186 "	
4 "	2,765	1:6800	2.64 " "	7,390	4%	7,592	5,937 "	
5 "	3,167	1:6750	2.88 " "	9,421	5%	9,597	7,922 "	
6 "	3,594	1:6700	3.12 " "	11,213	6%	11,886	10,231 "	
7 "	4,018	1:6650	3.33 " "	13,390	7%	14,316	12,663 "	
8 "	4,448	1:6600	3.52 " "	15,637	8%	16,509	15,254 "	
9 "	4,883	1:6550	3.73 " "	18,214	9%	19,833	18,198 "	
10 "	5,324	1:6500	3.92 " "	20,870	10%	22,957	21,302 "	
11 "	5,770	1:6500	4.10 " "	23,637	"	26,023	24,368 "	
12 "	6,222	1:6600	4.24 " "	26,381	"	29,019	27,364 "	
13 "	6,678	1:6700	4.39 " "	29,316	"	32,248	30,593 "	
14 "	7,139	1:6800	4.53 " "	32,340	"	35,574	33,919 "	
15 "	7,604	1:6900	4.66 " "	35,435	"	38,978	37,323 "	
16.1 h. w.	8,123	1:7000	4.80 " "	38,990	"	42,889	41,234 "	
After passing 11 ft. this does not show all of flood flow, as water would begin at this height to leave river above cross section.								
Flow at low water, no rise	1,226	1:10000	1.35 ft. sec ..	1,655				
Flow Feb. 17, '97.								
2.1 ft. up	2,009	1:10000	1.84 " "	3,697				

XIII.

That the undisputed evidence shows that a cross section was also taken twenty-one miles (by river) above Brownsville, Texas, and shows the capacity of the river at said point to be as follows:

Estimated flow of Rio Grande 21 miles (by river) above Brownsville, Texas. Conditions assumed: River at low water, sudden rise comes, rising 1 ft. in 4 hours at first, and going on up to high water.

State of	Cross sect. sq. ft.	Fall.	Current.	Flow sec. ft.	Add % for possible scour.	Max. flow sec. ft.	Added water for rise.	
Low water	1,198	1:6300	1.60 ft. sec ..	1,917	.....	1,917	336 s. f.	1,581 s. f. at l. w.
1 ft. rise	1,588	1:6200	1.92 " "	3,045	1%	3,079	1,498 "	
2 "	1,989	1:6100	2.24 " "	4,455	2%	4,544	2,963 "	
3 ft. rise	2,396	1:6000	2.55 " "	6,110	3%	6,354	4,773 "	
137 4 "	2,808	1:5900	2.84 ft. sec ..	7,975	4%	8,373	6,792 s. f.	
5 "	3,223	1:5800	3.11 " "	10,023	5%	10,724	9,143 "	
6 ft. rise	3,641	1:5700	3.37 " "	12,270	6%	13,252	11,671 "	
7 "	4,062	1:5750	3.60 " "	14,623	7%	15,939	14,358 "	
8 "	4,485	1:5700	3.82 " "	17,133	9%	18,846	17,265 "	
9 "	4,913	1:5700	4.03 " "	19,800	"	21,780	20,199 "	
10 "	5,344	1:5900	4.17 " "	22,284	"	24,512	22,931 "	
11 "	5,777	1:6100	4.28 " "	24,725	"	27,197	25,616 "	
12.1 " H. W.	6,257	1:6300	4.42 " "	27,656	"	30,421	28,840 "	
After passing 8 ft. or 9 ft. this does not show all of flood flow, as water would begin at this height to leave river channel above cross section.								
Flow at low water, no rise	1,198	1:9000	1.32 ft. sec ..	1,581				
Flow Feb. 24 '98, 1.3 ft. up ..	1,700	1:9000	1.66 " "	2,822				

XIV.

That the undisputed testimony in the case shows the following table of distance, viz:

Distances along Rio Grande, scaled from maps.

From—	To—	Distance by channel.	Distance along axis.
Headwaters	Del Norte		80 miles.
Del Norte	Colorado State line	65	65
state line	Embudo	30	30
Embudo	White Rock Cañon	15	15
White Rock Cañon	(Length)	50	50
Albuquerque	San Marcial	100	100
San Marcial	Elephant Butte	40	40
Albuquerque	Fort Seldon	65	65
San Marcial	El Paso	60	60
Elephant Butte	Lower end El Paso Valley	80	80
Fort Seldon	Mouth Concho River	125	125
El Paso	Mouth Pecos River	250	250
Lower end valley	Mouth Devils River	35	35
Mouth Concho	Eagle Pass	65	65
Mouth Pecos	Laredo	110	110
Mouth Devils	Mouth Salado River	70 miles	55
Eagle Pass	Mouth Abasco River	50	35
Laredo	Roma	8	7
Mouth Salado	Mouth San Juan	12	10
Abasco	Rio Grande City	2	2
Roma	Brownsville	177	95
Mouth San Juan	Mouth Rio Grande	85	30
Rio Grande City			
Brownsville			

XV.

That the proposed dam and reservoir of the defendants would contain 11,036,722,000 cubic feet of water, or 253,370 acre-feet of water.

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XVI.

That the said defendants propose to irrigate 230,000 acres of valley and 300,000 acres of mesa lands, in all 530,000 acres; that in accordance with the amount of water used in Colorado and New Mexico for irrigating lands, it will require 954,000 acre-feet of water to irrigate that quantity of land proposed to be irrigated by defendants, or from three to four times the capacity of said reservoir.

(See pages 101-2-3, Follett's report. Senate Doc. 229.)

XVII.

The undisputed testimony in the case shows the following to be the time it would have taken all the flow of the Rio Grande to have filled the Elephant Butte reservoir, supposing it to hold 253,000 acre-feet, during the maximum flow in each year, from El Paso gauging station, viz:

1889. All of May flow and 8 or 10 days of June flow	40 days
1890. From May 15th to June 3rd	19 "
1891. From May 12th to May 20th	9 "
1892. From May 2nd to May 17th	16 "
1893. From April 25th to May 31st	37 "
1897. From May 24th to June 3rd	11 "
1898. Two floods, April 22nd to May 8th, and July 17th to July 25th	26 "
1899. No flood. Total flow for year only 70,000 acre-ft. at El Paso.	

XVIII.

The undisputed testimony in the case shows the time necessary each year to fill the proposed Elephant Butte reservoir of the defendants, supposing it to hold 253,000 acre-feet, and starting at the beginning of spring flood and allowing enough water to pass the proposed dam to supply all ditches below it, assuming this amount to be 500 sec. ft. for El Paso Valley, would be as follows, viz:

1889.	From record of El Paso gauging station, all surplus flow above 500 sec. ft. from May 1st to June 15th.....	46 days
1890.	Same conditions, from April 17th to May 19th.....	33 "
1891.	Same conditions, from April 12 to May 3rd....	22 "
1892.	Same conditions, from April 15 to May 7th....	23 "
1893.	All surplus flow above 500 sec. ft. at El Paso gauging stations for irrigation season would lack 11,000 acre-ft. of filling reservoir.	
1897.	From record of El Paso gauging stations, all surplus flow above 500 sec. ft. from April 13 to May 11th....	29 "
1898.	From record of El Paso gauging station, same as above, from April 17 to June 20th.....	65 "
1899.	During whole season only 6,500 acre-ft. passed El Paso gauging station above 500 sec. ft.	

XIX.

That the undisputed evidence in the case shows that cross sections of the Rio Grande were taken by a member of the boundary commission to the extent of three to four per mile for the entire distance from Rio Grande City to Brownsville, Texas, and that the two cross sections heretofore referred to were a fair indication of the contour of the Rio Grande.

XX.

The court finds, as a matter of fact, that the Rio Grande has no perennial tributary flowing into it between the point where the defendant proposes to construct its dam at Elephant Butte, about 125 miles above El Paso, and the Rio Concho, which forms its junction with the Rio Grande at Presidio del Norte, about 205 miles below El Paso, measured by the axis of the stream, and that such streams as are tributary to it add to its waters only during flood seasons between said Elephant Butte and Presidio del Norte.

XXI.

The court further finds, as a matter of fact, that the construction of the dam proposed to be constructed by the defendant corporation at Elephant Butte, a point about 125 miles above El Paso, would substantially impair the navigability of the Rio Grande at the point where it is now navigable.

Be it remembered, that on the 28th day of April, A. D. 1900, there was filed in the office of said clerk of said court, a transcript of the evi-

140 dence taken on said trial and hearing of said cause, which said transcript was certified by the stenographer and judge of said court, and is as follows, to wit:

In the district court of the third judicial district of the Territory of New Mexico.

THE UNITED STATES OF AMERICA, PLAINTIFF,	} No. 1243. Injunction.
vs.	
THE RIO GRANDE DAM & IRRIGATION COMPANY et als., defendants.	

TRANSCRIPT OF EVIDENCE.

LAS CRUCES, NEW MEXICO,
December 12th, 1899.

The hearing of the above-entitled cause is begun before the honorable Frank W. Parker, associate justice of the supreme court of the Territory of New Mexico, and judge of the third judicial district thereof.

Present: Judge Frank W. Parker; Judge M. C. Burch and William B. Childers, esq., counsel for plaintiff; Judge A. B. Fall, W. A. Hawkins, esq., and John Franklin, counsel for defendants.

PLAINTIFF'S CASE.

Judge Burch, on behalf of the plaintiff, in opening the case of the Government, made a statement as to what the Government expected to prove, and further stated to the court that, for the purpose of bringing to the attention of the court at this hearing certain portions of the record at the former trial, he would ask leave to read into the record

141 such portions as he deemed proper at this time.

Judge BURCH. I desire to take up this proposition and call the attention of the court to certain portions of it, and ask the reporter to take down so we may have a complete record of

Mr. HAWKINS. Don't you think it would be well enough to have the court indicate what it would consider in evidence already?

Judge BURCH. Yes; I am ready to take any course of that kind.

Mr. HAWKINS. I only suggested it, as a controversy might arise that you had failed to put in something that you might want.

Judge BURCH. Do you mean as to the printed evidence?

Mr. HAWKINS. I mean with reference to the exhibits that have already been filed in the case.

The COURT. I am not familiar with the record. Was there any class of evidence excluded at the former hearing?

Mr. HAWKINS. Everything was put in by both sides that had any bearing on the case.

Mr. CHILDERS. Here is a printed copy of the record on the former hearing. It didn't include all the printed documents that were in evidence. I unde'stand that prospectus was an exhibit, if I remember correctly, to the bill, and made a part of the record in that way.

Judge BURCH. The prospectus was made an exhibit and part of the bill.

Judge FALL. I presume, then, it is in.

The COURT. It may be assumed that all evidence of every character admitted by the court on the former hearing is now admitted.

Judge BURCH. With that understanding, I would like to call particularly to the court's attention, and have read into this record, for the purpose of making up a record in the Supreme Court, if necessary, certain parts of that printed record of the former hearing. I call the court's attention to the last paragraph on page 31, as follows:

"The vendor company has secured, under United States Federal law, the only feasible reservoir site on the Rio Grande in southern New Mexico, and the completion of the storage dam at Elephant Butte
142 will create the largest artificial lake in the world (11,036,722,000 cubic feet), at a cost of 4.9d. per acre-foot (capacity), as compared with the cost of the Sweetwater Dam (California), £8 10s. 5d. per acre-foot; the Merced Valled Dam (California), £5 10s. 10d.; Castlewood Dam (Colorado), £7 10s. 4d. per acre-foot. Vide the engineer's report." That is a statement made in the prospectus.

Now, I desire to again call the attention of the court, and have read into the record from the same document, and beginning on the same page, the last partial paragraph, as follows:

"In acquiring this splendid natural reservoir site the company will obtain control of the entire flow of the Rio Grande in southern New Mexico, the only practical means of irrigating what is now considered to be the finest fruit and vine country in the United States."

Now, the last paragraph again on page 33, last partial paragraph from the prospectus, the first three lines of that paragraph:

"When the whole of the proposed irrigation works are carried out, over 230,000 acres of valley lands and about 300,000 acres of mesa lands will be under ditch."

And again, on page 34, about the middle of the page, one paragraph and part of another:

"The property and enterprise and the cost of building the canals and a solid masonry (stone and concrete) dam have been exhaustively investigated and reported upon by the company's engineer, a thoroughly competent authority in irrigation and hydraulic matters."

The engineer's estimates for construction (allowing for contingencies—see report) are as follows: Main dam at Elephant Butte, £52,398 19s. 2d.; Dam No. 2 (weir, ditch head), £5,807 1s. 8d.; Dam No. 4 (ditch head), £4,095 6s. 3d.; * * *

Now, so far as the purpose of the Rio Grande Irrigation and Land Company, which claims to be the vendee of the Rio Grande Dam & Irrigation Company, we find them to be stated in the prospectus, page 37 of the record, as follows:

143 " * * * and in particular to build dams, weirs, canals, sluices, acequias, ditches, culverts, filter beds, pipes, aqueducts, and other irrigation works, either for irrigation or other purposes, and to execute and do all other works necessary or convenient for obtaining, storing, impounding, selling, delivering, distributing, and measuring water for irrigating the lands of the company, or for the sale and distribution of

water to landowners or occupiers of lands not belonging to the company, and for the sale of water rights, and for carrying on the business of an irrigation and waterworks company in all its branches. To erect, improve, and maintain piers, warehouses, factories, foundries, wharves, dwelling houses, and such other premises, buildings, mills, machinery and plant, and to construct such roads, railways, tramways, waterworks, reservoirs, telegraph, water, gas, electric, and power supply works, shops, stores, drainage, sanitary, and other works and conveniences as may seem calculated, directly or indirectly, to advance the company's interests.

"(ii) To supply water to cities and towns and others for irrigation, domestic and municipal purposes, and for milling and mechanical power. To irrigate, colonize, cultivate, improve, develop, and otherwise turn to account the resources of any lands, estates, or other properties that may be acquired by the company."

Now, coming to the defendants' attempt to modify in their answer the proposition which we have already charged the attention of the court, I desire to call the attention of the court to the following, beginning at the 10th line of page 52 of the transcript, a portion of the answer of the defendants:

(Argument of counsel as to propriety of reading part of answer.)
 "these defendants state that the entire flow of the Rio Grande during the irrigation season, at the point or points where these defendants are seeking to construct reservoirs upon the same, has long since been diverted and is now owned and beneficially used by parties other than these defendants, in which diversion and appropriation of said waters these defendants have no property rights and that neither one of the defendants are seeking or have ever sought to appropriate or divert by means of structure above referred to, or contemplated diversion by means thereof, of any of the waters of said Rio Grande usually flowing in the bed thereof during the time when the same are usually put to beneficial use by those who have heretofore diverted the same; but, on the contrary, these defendants state that it has been their intention, and their sole intention, by means of the structures which they contemplate and which are complained of in said bill, to store, control, divert, and use only such of the waters of said stream as are not legally diverted, appropriated, used, and owned by the others, and that these defendants have contemplated and now contemplate that any beneficial rights by them acquired in such stream by virtue of such structures will be very largely only so acquired to the excess, storm, and flood waters thereof now unappropriated, useless, and which go to waste."

Judge BURCH. The foregoing, if the court please, goes to the first point I attempted to make; that is, to the contemplated acts of the defendant.

FRANCISCO YTURRIA, a witness on behalf of the United States, living at Brownsville, Cameron County, Texas, having previously given his testimony by deposition, taken on direct and cross-interrogatories, the said deposition was then read in evidence as follows:

Interrogatory first. What is your name, age, residence, and occupation?

Answer. My name is Francisco Yturria; I am sixty-nine years of age; I reside in Brownsville, Cameron County, State of Texas; I am a merchant by occupation.

Interrogatory second. When did you first see the Rio Grande? How long have you had personal observation of it, and over what part of it has your personal observation extended? State fully.

Answer. In 1830. All my life; from its mouth to Laredo, Texas.

Interrogatory third. State what you know, if anything, by personal experience, if you had any, as well as by personal observation, of the navigation of said river, the character of such navigation, the amount and extent thereof, and the time when such experience and observation began and ceased.

Answer. To my personal knowledge the Rio Grande River in the year 1848 was in good boating condition to Comargo, Mexico; at that time, amongst the steamboats on the river, I remember one called the "McKey" that drew four feet of water; at that time there were many Government steamboats plying between the mouth of the river, Matamoros, and Comargo; during that time I made two trips to Comargo.

Interrogatory fourth. State what you know from personal observation and experience, or either, concerning the navigable capacity of said river when you first knew of the same, mentioning that part of its course which had a navigable capacity, and what portions of the year it was navigable, naming the months or parts of months, according to your best recollection.

Answer. To the best of my recollection, the river was in good boating condition from 1848 to 1873 as far up as Comargo, Mexico. It was navigable during the whole year.

Interrogatory fifth. State, from your personal observation or experience, or both, whether since your first knowledge, if you have any, any change has occurred in the navigable capacity of said river, and, as nearly as you can, the year when such change became observable, the nature of such change, if any; its extent, and any circumstances which from time to time occurred to impress such change upon your mind.

Answer. Ever since the year 1873, to the best of my recollection, the river has been becoming lower and lower year by year. It was noticeable on account of the many sand banks formed in the river.

146 Interrogatory sixth. State what, if anything, you know, by personal observation, of the character of the streams which flow into the Rio Grande between its mouth at the Gulf of Mexico and the City of El Paso, Texas, as to the color of the waters of the same, if they have any peculiar colors; the extent of the waters they contribute to the Rio Grande; the time of the year when each is accustomed to furnish the greatest volume; and any other facts or circumstances within your personal knowledge affecting the navigable capacity of the river.

Answer. I know the San Juan River that enters the Rio Grande at Comargo, Mexico. During rainy seasons it causes the Rio Grande to rise to considerable proportions. The waters of the San Juan are a light bluish color. I also know the Salado River, near Guerrero, Mexico, which also empties into the Rio Grande. I don't remember the color of its waters. I know nothing about the other tributaries of the Rio Grande.

Interrogatory seventh. State what, if anything, you know of the color, nature, and extent of the waters of the Rio Grande at and above El Paso, Texas; and in this connection state what you know, or have known

from year to year since your knowledge began, of the effect of the flood waters, or so-called torrential flow, as to the time of the year when the same became manifest in navigation, and also state the same of the ordinary flow of waters, or so-called perennial flow, all of this as far as your knowledge will permit as to waters coming from and above El Paso.

Answer. I know nothing of waters of the Rio Grande at or above El Paso. During the months of June or July we generally have a rise in the river, which lasts a short time. During such time navigation is good.

Interrogatory eight. State what you know, from personal observation, of the character of bed of the said stream, as to hollows or depressions; as to whether the same or any part is porous and capable of rapid absorption of water; as to sloughs or bayous, and arroyos, so called, or
147 any other features outside of evaporation which would have a tendency to detract from navigable capacity during a low stage of water, and require to be filled before water coming down stream could be useful in tending to raise the river to a navigable height.

Answer. I know that there are many arroyos between Rio Grande City and the mouth of the river. These are the means of letting out through the country the waters from the river during the season of overflow, but do not at other times draw from the river, and do not detract from navigable capacity during a low stage of water.

Interrogatory ninth. State whether, within your knowledge of the river, there have been any changes in cutting timber along the stream, or of any other nature than the diversion of the water for mining and irrigation purposes, tending to impair or reduce the navigability of the stream in that part of the same where it was navigable when you first knew it.

Answer. I know of no cutting of timber along the stream, and know of no cause, of my own knowledge, that tends to impair or reduce the navigability of the river. I am posted as to river only from Comargo, Mexico, to its mouth. I have been informed that water has been used in large quantities for irrigation purposes above El Paso, but I do not know this of my personal knowledge; but I do know that the river in the last few years has become a mere stream in comparison with the river that was in 1873.

Interrogatory tenth. State whether, from your experience and knowledge of the said river, the construction of a dam, and the storage or impounding of any considerable quantity of water and the diversion of the same for manufacturing purposes at a point across the same, about 125 miles above El Paso, Texas, in the Territory of New Mexico, would have any influence upon the navigability of said river where it is now navigable, and if any, what that influence would be. Of this state fully, giving reasons.

Answer. Certainly the storage of a large quantity of water
148 would naturally cause the river to deteriorate in volume, and in time would make the river not navigable.

Interrogatory under Rule XXXIX: Do you know or can you set forth any other matter or thing which may be of benefit or advantage to the parties at issue in this cause or either of them, or that may be material

to the subject of this, your examination, or the matters in question in this cause? If yes, set forth the same fully and at large in your answer.

Answer. I know of nothing further bearing on this matter.

And the cross-interrogatories propounded to the said witness at the time of the taking of the said deposition aforesaid, and his answer to the same, were thereupon read in evidence as follows, that is to say:

1. Q. How long have you resided at the place of residence named by you, and how long have you been engaged in the business named by you in your direct examination? Where and at what places have you resided other than at the places so named by you, and from what time to what time at each of such places, and what other occupations have you been engaged in, and from what time to what time have you been so engaged in the same?

A. I have lived here since 1848; have been in business as merchant and stock raiser; have not been absent during that time except on some trip, but never to stay away any great length of time.

2. Q. Are either of you now, or have you been, in the employ of the United States, in any capacity, or have you worked for or been in the employ of the International Boundary Commission between Mexico and the United States; and if so, in what capacity?

A. I have not been in the employ of the United States or of the International Boundary Commission between Mexico and the United States.

3. Q. If, in answer to direct interrogatory number two, you undertake to state how long you have had personal observation of the Rio Grande, and over what part of it your personal observation has extended, please state how much of this river you have ever been over, and give the highest point on it you were ever on in person, and how often you have been to such point in person.

A. I have been up as high as Eagle Pass. I have been there twice. I know the river from Comargo, Mexico, to its mouth.

4. Q. If you have stated that you have been on the Rio Grande and given the highest point at which you have been, please state whether you have traveled over the intermediate points between such highest point and Brownsville, Texas, in person; and if so, please state what intermediate points you have traveled over, and how often you have been over such intermediate points or any particular one of the same, describing such point.

A. I have traveled from Matamoras, Mexico, to Reynosa, Comargo, Mier, Guerrero, Presidio, Rio Grande, to Piedras Negras, opposite Eagle Pass, Texas. I then came back from Eagle Pass to Laredo, Texas, Carrizo, Roma, Rio Grande City, and Brownsville. This trip was in 1864. I have been many times as far as Laredo, Texas, and back; all these towns mentioned are on the banks of the river, either in Texas or in Mexico.

5. Q. If you have stated that you have had personal observation of any portion of the Rio Grande, please give the length in miles, measured by the course of the river that you have had personal observation over, and the length of the same measured in a direct line between the highest point and the lowest point which has been covered by your observation.

A. I do not know the distance by river and cannot answer the question.

6. Q. If you have stated that you have had personal observation of any portion of said river, please name the tributaries which said river has on that portion of it covered by your observation, and also please state the distance from tributary to tributary, coming up the river, and whether such tributaries come in on the American or Mexican side of the river.

A. I know that from the mouth of the river to Guerrero there are two tributaries, the San Juan, at Comargo, and the Salado, at Guerrero, Mexico, about 57 miles by land. These tributaries empty into the river from the Mexican side.

7. Q. If you have named any tributaries which come into the Rio Grande, or have stated that you know of any tributaries that come into the same, please state all the facts which you know with reference to such tributaries, and state where they rise, how long they flow, whether the valleys of such tributaries are settled or unsettled, whether the waters of such tributaries are used for irrigation or mining purposes, how much land is cultivated on each tributary, and whether the waters of such tributary are used for irrigation or mining purposes.

A. I have not traveled these tributaries and therefore can not answer the questions.

8. Q. If you have stated that any of the waters of the tributaries of the Rio Grande are used for irrigation or mining purposes, please state how much of the same, and how long they have been so used, and state how much land is cultivated on each tributary by means of the water of the same, and what portion of the waters of such tributaries are used for irrigation or mining purposes.

A. I can not answer the question, for the same reason as above given.

9. Q. If you have stated that any part of the water of such tributaries so flowing into the Rio Grande is used for irrigation or mining purposes, please state at what point on the same waters are diverted from the streams for such purposes, and whether more or less water is now used on each of such tributaries, naming them, than was formerly used; and if so, when the increase or decrease in such use commenced and when it reached its maximum.

A. I can not answer; I don't know.

10. Q. If you have stated that you know of any of the tributaries of the Rio Grande, please state whether any dams or reservoirs are on any such streams, naming them, and if there are, where the same are situated, and in or across what streams they are constructed, and when they were constructed, and whether any of the same were constructed by authority of the Mexican Government or by its permission, if you know.

A. I don't know and can not answer.

11. Q. If you have stated that you are acquainted with any such tributaries of the Rio Grande, please state whether the flow of the same was or is constant, or whether the same is spasmodic or intermittent, describing in detail in this respect each particular tributary; and also state whether such streams are known as flood streams or perennial streams, and at what seasons of the year their floods generally come if they are flood streams, or if large floods come down the same, and how long such floods last, and what becomes of such floods.

A. The San Juan is a running stream. So is the Salado. I have crossed them often, and they were not dry. To the best of my knowledge they are running streams. I have seen the San Juan River during flood time overflow its banks. The water flows into the Rio Grande, and the rise does not continue long.

12. Q. If you have stated anything with reference to the navigation of the Rio Grande, please state the highest point on such river to which permanent navigation has ever extended.

A. I know that permanent navigation was to Camargo, Mexico, opposite Rio Grande City. At times steamboats could go as far as Roma, Texas.

13. Q. If you have stated that you know anything with reference to the navigation of the Rio Grande, please state how many boats were ever used and employed in such permanent navigation and how many are now used in the same, and what was the size and capacity of each of said boat or boats, and how much water each thereof drew, and how often such boats ascended or descended such river during the year, and during what months during the year they made their ascents and descents.

A. I know that in 1848 there were several Government steamboats plying between mouth of river and Camargo, Mexico; in the year 1870, I remember there were four or five large steamboats plying from mouth of river to Camargo. I can not state the amount of water they each drew. They made their ascents and descents at all times of the year. There is now only one steamboat on the river; she is called the "Bessie," and on account of the low stage of water existing in the river only now and then makes an occasional trip to Rio Grande City.

14. Q. If you have stated anything about any boats that navigated the Rio Grande at any time, please state whether such boats made their trips on such river on schedule time, and whether there were particular days of departures which were adhered to, or whether the trips were only occasional, intermittent, and without knowledge on the part of the public or boatmen as to when the boats would arrive at or depart from terminal or intermediate points at which they touched?

A. I know that previous to 1873 steamboats made regular trips to Rio Grande City, Texas, and Camargo, Mexico, which were duly advertised at Brownsville, Texas, at the office of King, Kennedy & Co.

15. Q. If you have stated that there ever was any navigation on the Rio Grande, or is any navigation on it now, please state to what extent the points and people along said river depended upon such navigation for commercial purposes in the past, and to what extent they depend on the same at present, and as to whether they did in the past, or do now, depend mostly on such navigation, or do they depend mostly upon freighting to and from railroads and commercial centers?

A. I know of my own knowledge that merchants depended entirely upon the steamboats up to 1873 and afterwards for the transportation of their merchandise, and would so continue to do if navigation were practicable at present. They are now compelled to ship goods from this port per carts to Rio Grande City and intermediate points along the river.

16. Q. Please state how long in recent years it would usually take a boat to ascend the Rio Grande, from Brownsville, Texas,

to Rio Grande City, and give the distance between Brownsville and Rio Grande City, when measured by the course of the river, and also the distance between said points along the usual traveled wagon road between the same.

A. In recent years it takes from one to two weeks to go to Rio Grande City from Brownsville. I do not know the distance to Rio Grande by river; by land it is considered 120 miles.

17. Q. Have you not personally observed hulls or wrecks of old boats inside the bar, at the mouth of the Rio Grande and up the course thereof and some distance therefrom?

A. I remember having seen many years ago the hull of a wrecked steamboat on the American side of the bar, at the mouth of the Rio Grande, but not obstructing the bar.

18. Q. If you have said that you observed any hulls or wrecks of old boats, as interrogated about, please state how these boats got there, and how far up the river their wrecks were observed by you, and state if you know how they came to be wrecked and when they were wrecked?

A. I have only seen the river stated in answer to cross-interrogatory No. 17, and don't know the cause of said steamboat being wrecked.

19. Q. As matter of fact, is it not true that such boats got into the river over the bar at the mouth thereof? And is it not a fact that many of them were cut in two in order to get them over the bar, and were afterwards abandoned by the parties undertaking to use them? And if "yes," state how long ago this occurred, and the reason, if you know, why the boats were so abandoned?

A. I know of no steamboat crossing the bar at the mouth of the river for many years. I have never heard of any boat being cut in two so as to get it over the bar.

20. Q. If you have stated that you know anything of the character or such navigation, state whether or not vessels can come in from the Gulf of Mexico to the mouth of the Rio Grande at the present time, and how far up the river they can come, from such Gulf. If you say they can not come into the mouth of such river or up the same, please state what prevents them from so doing?

A. Vessels may come over the bar drawing four feet of water, but can't proceed further than about six miles up the river. This is caused by the low stage of water.

21. Q. Is there not an obstruction at the mouth of the river Rio Grande which prevents boats from going into the same from the Gulf of Mexico; and if so, what is the obstruction?

A. Not that I know of.

22. Q. Do you know how much fall there is in the course of the river from Ringgold Barracks to the Gulf of Mexico per mile?

A. I don't know.

23. Q. What is the character of the current of the river Rio Grande immediately above its entrance into the Gulf of Mexico?

A. The current is slow.

24. Q. Has the Rio Grande for several miles from the mouth of the same any appreciable current?

A. Yes.

25. Q. How far up the course of the river Rio Grande do the tides of

the Gulf of Mexico affect the depth of the water in the river, and at what season of the year are these tides heaviest, and when at their heaviest how far up the river do they affect the current of the same?

A. I know that the tide extends up for six miles. It may be more, I don't know at what season they are the heaviest.

26. Q. In describing the character of the navigation which you testified with reference to, please state what the average depth of the water near Brownsville is during the period when it is usually deepest, and how far up the river the depth continues the same.

155 A. I have never measured it.

27. Q. At what period of the year is the depth of the river Rio Grande at Brownsville the greatest, and at what period is it the shallowest, and for how long does the depth continue at its maximum and how long does it continue at its minimum?

A. When the river is on the rise it is highest; at low stage it can at times be forded.

28. Q. How shallow does the water get in the river at Brownsville?

A. It gets very low indeed, almost fordable.

29. Q. What character of bed has the river Rio Grande, and is the bed of the same permanent or is it shifting? Is it rocky or is it sandy? Are there any shallows in it or any sand banks in it?

A. From Rio Grande City down it is sandy; there are shallows and sand banks in it.

30. Q. If you have stated that there are either shallows or sand banks in the bed of the Rio Grande River, please state whether the same are below Rio Grande City; and if they are, if they are sufficient to in any way impede the navigation of the river; and if they are, for how long do they impede navigation?

A. There are below Rio Grande City, and at times they impede navigation. I can't say for how long a period.

31. Q. If you have stated what the conditions of the bed or depth of the Rio Grande River is, please state how long such conditions have maintained within your knowledge.

A. The river has been very low for some years past.

32. Q. Was there ever, at any time within your knowledge, any great permanency to the channel of the Rio Grande River, so far as depth and course are concerned, or was the depth and course of the same constantly changing?

A. In former years the channel was better than it is or has been in years. I answer these questions to the best of my knowledge.

156 33. Q. What effect, so far as changing the banks and the bed of the Rio Grande, would the heavy floods which came down the river have?

A. It at times changes the channel of the river, and cuts off land from both sides of the river.

34. Q. How often during a trip up or down the river did the boat or boats which navigated the same ground upon these sand bars or shallows?

A. In former years very seldom.

35. Q. Did any one of you ever navigate the river Rio Grande on the *street* known as the "San Ramon," or a steamer bearing that character of name? If so, was that the correct name of such steamer? And if not, please give its correct name.

A. There was a large steamboat called the "San Roman," but I never travelled on her; she was on the river for several years.

36. Q. If any of you have said that you have navigated the Rio Grande River in the steamer referred to in the last preceding interrogatory, state whether any of you have any personal recollection of a trip that such steamer made in the first half of the year 1873, when it took 42 days or thereabouts to go from Brownsville to Rio Grande City; and if so, state what caused it to take such length of time, and how long it took such boat to go back down the river from Rio Grande City to Brownsville. And, if you state that it only required a few hours or a short time to do so, please state why such steamer was enabled to go back down the river so much more rapidly.

A. I never traveled on said boat, and know nothing of said trip.

37. Q. Do you remember that on the trip referred to in the last interrogatory, after said boat reached Rio Grande City, a flood came down the river and furnished sufficient water to float the boat back down the stream without touching on the sand bars or shallows?

A. No.

157 38. Q. In describing the navigation on the Rio Grande, please state whether the same was in the past ever a financial success; and if so, during what period it was financially successful, and whether, during the period when it was so successful, the navigation of the river was aided by either the Government of the United States or the Government of the Republic of Mexico.

A. In the past it was a financial success; before 1873 the navigation of the river was not aided by the United States or Mexico, that I know of.

39. Q. Please state whether or not the navigation of the Rio Grande River at the present time is successful or otherwise.

A. It is not.

40. Q. Please state what the ruling price per hundred pounds and also per ton has been in the past, within your knowledge, for transportation between Brownsville and Rio Grande City, when carried by boat; and what the ruling price, per hundred pounds and per ton, river freight now brings on the steamboat "Bessie" between such points, and state whether there is any other steamboat plying the said river at the present time besides the "Bessie."

A. In old times it was 75 cts. per barrel; at that time there were large quantities of freight; they are now charging about the same, only they make a trip about once in three months. The steamboat "Bessie" is the only steamboat on the river.

41. Q. In connection with the shipment of freight up and down the river Rio Grande, state whether there are any railroads which were built along the same for any distance, on either the Mexican or American side or which compete with the steamer "Bessie," and on which side of the river such railroads are built, and the termini of the same, and when the same were completed and for what commercial purpose the same were built.

158 A. There is a road running from Matamoros to San Miguel, about 90 miles up river on the Mexican side of the river, built for the purpose of carrying goods and passengers.

42. Q. Please state where the goods and supplies that are shipped over any such railroad for the Rio Grande country are delivered to the road.

A. At Matamoros, Mexico.

43. Q. Before this railroad was built what method was there of getting shipments of freight into Rio Grande City from distant points, other than by navigation from Brownsville, and what was the cost per hundred pounds or per ton of getting such shipments by such means?

A. This railroad does not carry freight to Rio Grande City.

44. Q. Before such railroad was built were not the rates for river freight greatly in excess of the rates put into effect by such railroad, and which now obtain on points along the Rio Grande River, and is not the freight on goods and supplies shipped over the railroad and by boat to points along the river Rio Grande now very much less than before such railroads were built? If so, was not the reduction in such freight rates caused by the construction of such railroad, and did not the construction of such railroad thereby cause the decline in the navigation of the river Rio Grande?

A. This railroad does not affect the carrying freight for Texas ports, Rio Grande City and others, and the freight charges on the river are about the same as they were before the road was built, to the best of my recollection.

45. Q. Could the navigation of the river from Brownsville up the stream be carried on after the construction of such railroad so as to successfully compete with the same in their freight rates between their termini and intermediate points along such river, and is not the decline of navigation on said river due to the inability of boats to compete with freight rates put in effect by such railroad?

159 A. Yes; navigation of the river could compete with the railroad successfully. No; it is on account of the decline of the water.

46. Q. Do you know the location of Camargo; and if so, how long have you known it, and was there ever any considerable amount of freight ascended such river on boats to Camargo to such point?

A. Yes; since 1848 there was.

47a. Q. Was not Camargo a center for the supplying of interior points of Mexico, even at great distances away therefrom? If it was, at what distance? Please state what sized place Camargo is now and what sized place it was prior to the building of such road, and if it is a place of less size now. Please state if it is not also of less commercial importance than formerly. State, if you know, what has caused the decline of Camargo in population and commercial importance.

A. It was hundreds of miles. It was a business center and had more population before the road was built than now. Yes; it is of less importance; the cause of the decline is on account of the freight formerly taken through there, which now goes by way of Laredo.

47b. Q. Was not this decline of Camargo due to the construction of the Mexican Internacional Railroad, running between Laredo and the interior points of Mexico, and connecting at Laredo with points in the United States? Does not such railroad now supply the interior points of Mexico, which formerly contributed to the commercial importance of Camargo, at cheaper rates of freight than could be had by navigation of the river?

A. Yes.

48. Q. If you have stated that any change has occurred in the commercial capacity of the Rio Grande River, and have undertaken to state the nature of such change, please state whether such statements made were all founded upon personal observation made by you or are partly or wholly suppositions or theories.

A. By observations.

160 49. Q. If you have undertaken to state that there are any changes in the navigable capacity of the Rio Grande River, please state what the effect of such changes were in the increase or decrease of the flow of the river at Brownsville; how much depth, more or less, did the river take on at Brownsville, and what was the effect; how much depth was there, more or less, at intermediate points between Brownsville and Ringgold Barracks, naming each place of prominence at which the water became deeper or shallower; at what points did you observe this effect; how often during the year when such effect was worked did you observe the same; how long did such effect continue?

A. I know that in former years the channel of the river was.

50. Q. Do you know whether in the year when such effect was first observable or within a year or so before the same was observable, there was any use commenced of any of the waters of any of the tributaries of the Rio Grande for purposes of irrigation or otherwise? If so, to what extent were such waters of such tributaries used?

A. I do not know.

51. Q. Do you know where the San Juan River empties into the Rio Grande? Does it come from the American or Mexican side? What was the amount of water contributed by the San Juan to the Rio Grande when you first knew the Rio Grande? Was it a considerable stream or an insignificant one? State how wide it was and about how deep and about the rapidity of its current where it emptied into the Rio Grande, if you know.

A. Yes; at Camargo, Mexican side. A good-size stream and very rapid at high water.

52. Q. If you have stated that there was any change in the navigable capacity of the Rio Grande, commencing at any period named by you, state whether during the year of such change or subsequent thereto the flow of said San Juan River was more or less than it had been in past years; and is the flow of such San Juan River more or less now than it was when you first became acquainted with the Rio Grande; 161 if so, to what extent has it increased or decreased? State, if you know, the cause of such increase or decrease. Are its waters now used for irrigation at any point on its course?

A. To the best of my knowledge it is the same as former years. I do not know if its waters are used for irrigation.

53. Q. Please state if, before any change which you may have referred to in the navigability of the Rio Grande took place, you were acquainted with the amount of water flowing into the Rio Grande from the Salado, the San Antonio, the San Rodriguez, the Santiago, the San Felipe, Devils River, Goodenough, the Pecos, and the Concho. If so, state where each of those rivers, or any one thereof with which you may be acquainted, comes into the Rio Grande with reference to the location of Rio Grande

City; that is, the number of miles above such city the mouth of such rivers are. State about what was the size of each of these streams, the depth, width, and velocity of current at the point where the same enter into the Rio Grande. Please state which ones of said rivers were larger and which smaller than the others; also, whether there had been any decrease, at the time of any change in the navigability of the Rio Grande occurred, in the flow of either of such streams. If so, which decreased in its flow from the time when you first knew the same up to the time when the navigable capacity of the Rio Grande underwent any change?

A. I only know the Salado and San Juan, the first at Guerrero, Mexico, the second at Camargo, Mexico. They both empty into the Rio Grande above Rio Grande City, the Salado 60 miles by bowel and the San Juan about 3 miles. They are both rapid streams during high water. The San Juan is the largest volume of water. I know of no change.

54. Q. As a matter of fact, were you ever personally at the mouth of any of these streams? If so, please name the same, and state when and how often you were there previous to such change in the navigable capacity of the Rio Grande; also, how often you have been there subsequent to such change in its navigable capacity.

A. At mouth of San Juan 1848 and 1864, not since; have often seen the river San Juan, but not the mouth.

162 55. Q. If in answer to the foregoing question you should state that there has been any decrease or increase in the amount of water flowing in any of the tributaries above named since the time when you first know the same, please state, if you know, what has caused such increase or decrease.

A. I have no answer.

56. Q. Do you know that the flow of such tributaries and of the Rio Grande varies and changes in accordance with the amount of rainfall, which occurs from year to year over the watershed drained by such Rio Grande and its tributaries?

A. I have heard that in the rainy season there is an increase caused by rainfall and causing a rise or overflow in the Rio Grande River.

57. Q. Do you not know that for a great many years past the rainfall in the watersheds adjacent to the Rio Grande and these tributaries, in that section of Texas and Mexico, has decreased and is now less than it was in the years immediately preceding 1887 or 1888?

A. Yes.

58. Q. As matter of fact, has there not been a drouth in that section of country since in the eighties, and has not this drouth resulted in the death of the greater portion of cattle and sheep, and even during periods necessitated the removal of portions of the population in various places along the river?

A. Yes.

59. Q. As matter of fact, is there now one-half as much rainfall as there was in that section of the country in such former years?

A. Yes.

60. Q. If, in answer to the sixth direct interrogatory, you state that you know anything by personal observation as to the colors of the water of any stream which flows into the Rio Grande between its mouth, at the Gulf of Mexico and the city of El Paso, Texas, please state how you know the same?

163 A. I know from personal observation that the waters of the San Juan are of light-blue color.

61. Q. At what points above the head of navigation did you ever observe personally the colors of the waters of any such tributary, and how many times did you ever observe the color of such water above the head of navigation?

A. The San Juan is the only one I noticed, and that is about 3 miles above Rio Grande City.

62. Q. If, in answering direct interrogatory number six, you have stated that you knew the color of any water, did you answer from having seen the same during your navigation of the river and after such water had mingled with the waters of such stream where navigable, or did you get your idea of the color from having seen it come out of the tributary before it had entered the Rio Grande?

A. I saw it before and after entering the Rio Grande, while navigating the said San Juan and Rio Grande rivers.

63. Q. Can you tell the color of the water of each of the following tributaries, respectively: San Juan, Salado, San Antonio, San Rodriguez, Santiago, San Philepe, Devils River, Pecos, and Concho? If so, please state the color of each one separately.

A. I only know the color of San Juan—light-blue color.

64. Q. What is the difference between the color of the Pecos and of the Concho? What is the difference between the color of the Concho and the Rio Grande before the Concho empties into it?

A. I don't know.

65. Q. If you undertake totell of the colors of each one of these tributaries, state how you know the same and whether your statement is derived from hearsay or from actual observation.

A. From actual observation of San Juan.

164 66. Q. Were you ever at El Paso, Texas? If so, when and how often? Did you ever see the Rio Grande at such place? If so, what was the color of the Rio Grande at that place?

A. No; never.

67. Q. Do you know that the color of any tributary of this stream is liable to vary and change greatly from time to time, in accordance with the droughts or the light floods or the excessive floods, or even the particular dry arroyos through which such floods from time to time enter such tributaries?

A. I don't know; they may.

68. Q. Do you know if a heavy rainfall comes upon any particularly timbered section of a watershed of one of these tributaries, making a flood in the tributary itself, that the color is liable to be very greatly different from the color of a flood in such tributary caused by an excessive rainfall in the nontimbered parts of the watershed of such tributary?

A. I don't know.

69. Q. If you say that you know the color of the floods of the Pecos River which empties into the Rio Grande, please state whether in recent years there has been any change in the color of the Pecos floods.

A. I have no answer; don't know.

70. Q. Witness Kelly is asked whether he is the same man who made

an affidavit to be used in the trial of the injunction which was granted in this case, in 1896 or 1897, and whether it is true that he therein stated that he has not observed or heard remarked on the river any reference to waters which, from their color, appeared to come from the Upper Rio Grande itself since in the early eighties. In this connection said witness is asked to state when he last observed flood waters, while on the navigable part of the Rio Grande, which from their color he judged to come from the Upper Rio Grande?

165 A. I have no answer.

71. Q. If it is true that witness Kelly has not observed any flood waters on the navigable portion of the Rio Grande which from their color he judged to come from the Upper Rio Grande, then is it not true, according to his observation, that the flood waters of the Rio Grande have not contributed materially to the navigation of that stream since in the early eighties?

A. I don't know.

72. Q. For how long a period during each year, and at what time of the year, is the amount of the water in the Rio Grande, in its navigable parts, substantially increased by flood flows coming in from its tributaries?

A. During the months of June and July, while the flood lasts—only a short time.

73. Q. During such period, to what extent is the navigable depth of the Rio Grande increased, and how much is such stream widened?

A. Twenty-odd feet, and width in some places extends for miles.

74. Q. When such floods come are the waters confined within the banks, or do such floods rise over the banks of the Rio Grande and deposit waters in lagoons, lakes, and depressions?

A. Yes; it overflows and fills the lakes, &c.

75. Q. What portion of any particular flood which may in a week or ten days pass Ringgold Barracks will reach Brownsville? Does the amount of water which will reach Brownsville from such flood, lasting, say, a week at the head of navigation, constantly decrease as it comes down the channel and deposit itself in such bayous and lakes, or is absorbed by the same?

A. Arrives from Rio Grande City in three or four days; it decreases on account of the adjoining arroyos, &c.

166 76. Q. Have you any knowledge or information as to how far below El Paso water will run in the channel of the river before it is absorbed and taken up by the sand, when for five days or ten days or thirty days, at El Paso, such waters run one foot deep and fifty feet wide, or when it ran at any other particular depth or width for any given period of time at El Paso?

A. No.

77. Q. Do you know what would be the effect of a flood at El Paso, Texas, which ran a thousand cubic feet per second for one day or ten days or twenty days or thirty days, so far as increasing the depth and velocity of water in the river at Fort Quitman, Presidio del Norte, or the mouth of the Pecos, or Eagle Pass, or Rio Grande City, or Brownsville is concerned?

A. No.

78. Q. Do you know how much the river would be raised at Rio

Grande City by a flood passing El Paso, Texas, amounting to 15,000 cubic feet of water per second and running for ten days at that rate?

A. No.

79. Q. Do you know, in the month of May, 1897, whether any floods entered the Rio Grande from either the San Juan, Salado, San Antonio, the San Rodriguez, Santiago, San Felipe, Devils River, Pecos, or the Concho? If so, which one of these streams do you know of any flood entering the Rio Grande from during that month?

A. I don't remember.

80. Q. Have you any knowledge as to whether a flood came from either one of these tributaries into the Rio Grande during that month? Please state which one of them you do not know with reference to?

A. I don't remember.

81. Q. Do you know whether there was a flood from either one of those streams entering into the Rio Grande during the present
167 calendar year? If so, which one of them had a flood, and what month did the same occur in? If you do not know with reference to any one of the same during the present year, please state which one you do not know with reference to?

A. There have been several rises this year, but I don't know from what source.

82. Q. In interrogatory seventh, you are asked to state your full knowledge of the effect of the ordinary flow of waters and of the flood waters which came from above El Paso. As matter of fact, have you had any personal observation which will enable you to state just what regular flow or flood flow comes from El Paso, or above there, or are you simply depending upon hearsay as to that?

A. I answer I don't know.

83. Q. Do you know anything about the amount of waters which have flowed regularly by El Paso since 1880 or previous thereto?

A. No.

84. Q. What was the width and the depth of the water flowing in the Rio Grande, past El Paso, in 1880? What was it, 1885? What was it in 1890? What was it in 1895? What was it in 1899?

A. I don't know.

85. Q. Do you know during what years between these dates, or previous to those dates, the river has been absolutely dry at El Paso for any considerable number of months in the year; and if so, what months?

A. No.

86. Q. Do you know what flood flows passed El Paso in years above named? Do you know how long the flood of 1897, at El Paso, lasted?

A. No.

87. Q. If you have testified as to any flood flows passing by El
168 Paso during any of these years state whether you were at El Paso and saw them or whether you were simply guessing that they passed El Paso because you saw them at some point further down the river.

A. I have no answer.

88. Q. If you saw any floods down the river at any navigable part thereof during any of those years, is it not possible that they may have come from some of the tributaries of the Rio Grande above named?

A. Yes.

89. Q. Is it not possible that such floods may have come from heavy rains along the Rio Grande below El Paso?

A. Yes.

90. Q. How far above El Paso were you ever? Did you ever come up the Rio Grande from the head of navigation to El Paso overland and observe the flow of the Rio Grande along its entire course?

A. Never; no.

91. Q. If, in answer to interrogatory eighth, you state that you have personally observed the bed of the said Rio Grande as to hollows or depressions, and that the same is porous and capable of large absorption, or that the same has sloughs or bayous and arroyos, which have a natural tendency to detract from its navigable capacity during a low stage of water, and which have to be filled before the river can be raised by floods and increased flow, please state what ultimately becomes of the water which is consumed by such porous character of soil, or which runs into such sloughs or bayous or arroyos.

A. See my answer to eighth direct interrogatory.

92. Q. Does this water stand in such sloughs and bayous until it is absorbed by the soil or by evaporation?

A. By both.

93. Q. If you state that you have observed such sloughs and bayous, state how far up the river you have observed the same, and whether
169 practically the same condition does not continue up the stream to El Paso and north of that place.

A. I know from Laredo down only.

94. Q. If you state that such sloughs and bayous check and hold these waters, such waters sink into the sand and are absorbed, please state if these facts would not tend to constantly decrease any floods which might pass El Paso and so decrease the same as to practically consume it, so that it would not substantially aid navigation where said river is navigable.

A. In former years the volume of water would fill up the arroyos, &c., leaving plenty of water in the river, but now it does not leave same amount.

95. Q. If, in answer to interrogatory eight, you state that the flood waters of the river are necessary to fill bayous and depressions in order to keep the regular current flowing down, then please state whether, in your opinion, that result is the greatest good produced by these floods. As matter of fact the floods are treacherous, are they not?

A. As a matter of fact floods are treacherous; floods are good for crops along the banks of the stream.

96. Q. Are you acquainted with the steamer "Bessie;" and if so, what relation towards it do any of you bear? Can the steamer "Bessie" come up the Rio Grande against a flood coming down the stream with any considerable force?

A. I know the steamboat "Bessie;" I have no interest in her. Yes.

97. Q. It is a fact, is it not, that it is exceedingly trying and dangerous to the safety of the vessel and the progress of the same to undertake to navigate the river, depending upon this flood flow?

A. Yes; on account of the drift and the chance of water falling rapidly.

170 98. Q. It is true, is it not, that if the steamer comes up the Rio Grande during a flood, it is exceedingly liable to be stranded

by reason of the subsidence of the flood before the steamer reaches its destination?

A. Yes; I think so.

99. Q. Can the steamer "Bessie" come up the Rio Grande at all during the heaviest flood flows which occur along its navigable course? Is it not true that she can better navigate when the floods are not greatest, and that if the excessive floods were lessened she would make quicker and safer trips?

A. I do not know.

100. Q. How many irrigation ditches do you know of from the vicinity of El Paso to Brownsville, Texas? If any, where are the same located and how much of the Rio Grande do they divert, and on which side of the river are they—on the American or Mexican side?

A. I don't know any.

101. Q. In direct interrogatory tenth, you are asked what would be the effect of storing water 125 miles above El Paso, Texas, so far as the navigability of said river is concerned. Do you know a point named as Elephant Butte, about 125 miles above El Paso, Texas? Were you ever at such point? Do you know whether the bed of the proposed reservoir at Elephant Butte is sandy or whether the river at that point flows through a rocky cañon? When were you there?

A. I answer I do not know Elephant Butte; no.

102. Q. Do you know of the character of the bed of such stream below Elephant Butte down to a point of rocks just above Las Cruces, New Mexico? What is the character of the bed of such stream at such point?

A. I don't know.

103. Q. Have you ever been connected with an irrigation company, or had any experience in the use of waters from reservoirs? If so, where and what experience have you had? How large was the reservoir with which you had such experience?

A. No.

104. Q. Do you know what per cent of the waters which would be impounded by a dam thrown across the river 125 miles above El Paso, Texas, would pass off by evaporation?

A. No.

105. Q. Suppose such dam held water 50 feet deep, 10 miles long, and a mile wide; what amount in depth of such water in such place would pass off by evaporation, and how do you know that?

A. I don't know.

106. Q. Do you know how much such water, when being let out of such dam and used in the neighborhood thereof for irrigation without being taken out of the valley of the Rio Grande, would return to the Rio Grande and contribute to its flow? If so, what per cent would so return? What would become of the balance of the water? What part of it would pass off in vegetation? What per cent of what is lost would be due to absorption?

A. I do not know.

107. Q. What would be the effect upon the flow of the river at its navigable parts if the water of the stream so impounded at this point, 125 miles above El Paso, and used, as asked in direct interrogatory tenth,

for manufacturing purposes and let back into the river into such quantities as would be sufficient to supply all ordinary manufacturing purposes which might be located thereunder?

A. I don't know.

108. Q. As matter of fact, have you sufficient technical knowledge to be certain what the effect of impounding the waters of the Rio Grande, 125 miles above El Paso, and using them along the banks of the stream for irrigation, would have upon the flow? Do you not know it to be a fact that such acts would tend to equalize the average flow of such river?

172 A. No.

109. Q. If 500 cubic feet of water per second were taken out of a reservoir constructed 125 miles above El Paso, how much of it would reach El Paso, and how much of it would be lost in the bed of the river itself by absorption and evaporation?

A. I don't know.

110. Q. If 500 feet of water reached El Paso, Texas, traveling down the bed of the stream, after having been turned out of a reservoir 125 miles above El Paso, how much of it would be diverted out of the stream by the Juarez Dam at El Paso and flow off down the Juarez Canal, on the Mexican side, and how much of it would be diverted by the El Paso wing dam and flow down through El Paso?

A. I don't know.

111. Q. If you have stated that the flood waters of the Upper Rio Grande over reach the lower portion of the river, please state at what season of the year the floods usually come down the river?

A. In the months of June and July.

112. Q. If any of the flood waters from El Paso or above ever come down the Rio Grande and you have undertaken to state that there are any sloughs, bayous, or arroyos in the bed of the stream which such flood waters might fill up or that such flood waters do actually fill up the same, please state when the flood waters fill the same and how long the waters remain therein. State if it is not a fact that even if enough flood waters came down to fill the sloughs, bayous, and depressions in the bed of the Rio Grande that such flood waters would and do evaporate or disappear before the perennial flow of the Rio Grande comes down the same?

A. It becomes low. I don't know the cause.

113. Q. Have not the floods of the Rio Grande at Presidio, Rio Grande City, Laredo, Eagle Pass, and Brownsville been greater during the present year than they have been for many years previous?

173 If you answer that they have not, please state during what years, within the the past 10 years, and during what month of such years, there have been heavier floods than during the present year. In your answer name each year during the last ten years and the month or months of each year during which the floods have been greater than they have the highest water reached by the river at each of such points during the present year, and the time of such high water and the highest water at each of said points during the past ten years.

A. The floods have been larger this year than many years past. I don't remember the height of water.

114. Q. With whom have you conversed about giving testimony in this case? Were you asked to come in person at the trial of this case and give your personal evidence by anyone? If so, whom? When did you first see or have read to you the interrogatories and cross-interrogatories which have been propounded to you, and who first showed them to you or told you of the same?

A. Warner P. Sutton told me that I would be summoned as a witness. I was served with notice Nov. 29th, 1899, at 9 a. m., by U. S. Commissioner Chas. F. Tilghman, and saw the direct and cross interrogatories at his office at 11 a. m., when he commenced taking the testimony. This is the first time I saw them. I did not converse with Mr. Sutton in regard to the matter.

115. Q. Have you read over such interrogatories or cross-interrogatories with anyone previous to having the same propounded to you by the officer taking your deposition? If so, with whom did you read over the same?

A. I have not.

116. Q. Has anyone written out for you or furnished you with a written answer or suggested a written answer which would be suitable to any of the interrogatories or cross-interrogatories which have been submitted to you? If so, who has done so?

A. No.

117. Q. Has anyone suggested any portion of the answer, or any portion of an answer, to these interrogatories? If so, whom?

A. No.

118. Q. Do you speak English, or have the questions been translated to you? If so, have your replies thereto been translated into English before being written down?

A. I speak and write English.

119. Q. In whose presence and where and on what day have you given these answers? Name everyone who has been present while you was giving this testimony, listening to the same. Has any attorney been present? If so, give his name, and state whether he was the attorney for the plaintiff or for the defendant.

A. No one was present; no one was listening. No attorney represented either side before the commissioner.

120. Q. Has any representative of the United States Government, or pretending to so represent it, been present at the taking of this testimony? If so, state his name.

A. No one.

(Signed)

FRANCISCO YTURRIA.

ROBERT DALZELL, a witness on behalf of the United States, living at Brownsville, Cameron County, Texas, having previously given his testimony by deposition, taken on direct and cross interrogatories, the said deposition was then read in evidence, as follows:

175 Interrogatory 1. Q. What is your name, age, residence, and occupation?

A. My age is 69 years; Brownsville, Cameron County, Texas; retired steamboat owner; my name is Robert Dalzell.

Interrogatory 2. Q. When did you first see the Rio Grande, how

long have you had personal observation of it, and over what part of it has your personal observation extended? State fully.

A. In the latter part of 1847, or January, 1848. Have lived here all the time except 4 years. From the mouth to Mier, Mexico. I was captain and pilot from 1850 to 1874.

Interrogatory 3. Q. State what you know, if anything, by personal experience, if you had any, as well as by personal observation of the navigation of said river, the character of such navigation, the amount and extent thereof, and the time when such experience and observation began and ceased.

A. I was employed either as captain or pilot either in the upper or lower river. The lower was from Brownsville to the mouth of the Rio Grande, distance about 65 miles; the upper from Brownsville to Roma, the head of navigation, distance 250 miles by river. The river was navigable all the year around for the class of boats we had here. The boats in the lower river drew $3\frac{1}{2}$ feet light; in the upper river they drew 2 to $2\frac{1}{2}$ feet light. Boats drew 4 feet to $4\frac{1}{2}$ feet when loaded for up-river trips, and in the lower river $4\frac{1}{2}$ to 5 feet when loaded.

Interrogatory 4. Q. State what you know, of personal observation and experience, or either, concerning the navigable capacity of said river when you first knew the same, mentioning that part of its course which had a navigable capacity, and what portions of the year it was navigable, naming the months, or parts of months, according to your best recollection.

A. It was navigable above and below all the year round.

176 Interrogatory 5. Q. State from your personal observation or experience, or both, whether since your first knowledge, if you have any, any change has occurred in the navigable capacity of said river, and as nearly as you can the year when such change became observable, the nature of such change, if any; its extent, and any circumstance which, from time to time, occurred to impress such change upon your mind.

A. To the best of my recollection the river began to depreciate about 1873 or 1874, and has continued to do so ever since, and I am satisfied that the boats we then used on the river could not now be used more than about 5 or 6 months during the year. The change consisted in the diminished flow of water, except at or during flood stage. Since the year 1874 I have not been employed on the river, but have made several trips on the river since, and know of the difficulties of the persons who have succeeded us in the steamboat business. I was a member of the firm of King, Kennedy & Co., steamboat owners on the river. They had been in the steamboat business from 1850 to 1874.

Interrogatory 6. Q. State what, if anything, you know, by personal observation, of the character of the *sicams* which flow into the Rio Grande between its mouth at the Gulf of Mexico and the City of El Paso, Texas, as to the color of the waters of the same. If they have any peculiar colors; the extent of the waters they contribute to the Rio Grande; the time of the year each is accustomed to furnish the greatest volume, and any other facts or circumstances within your personal knowledge affecting the navigable capacity of the river.

A. I have no knowledge of any except the San Juan and Salado; the rises that come from El Paso down are usually of a red-ish color; the water from the San Juan and Salado are usually of a dirty, milky

color. From June to September the greatest volume of water is contributed.

177 Interrogatory 7. Q. State what, if anything, you know of the color, nature, and extent of the waters of the Rio Grande at and above El Paso, Texas, and in this connection state what you know, or have known, from year to year, since your knowledge began, of the effect of the flood waters, or so-called torrential flow; as to the time of the year when the same became manifest in navigation, and also state the same of the ordinary flow of waters, or so-called perennial flow; all of this, as far as your knowledge will permit, as to waters coming from and above El Paso.

A. I know nothing about the Salado. In former years we generally looked for the first rise of the year in June, and were liable to have rises from that time until September.

Interrogatory 8. Q. State what you know, from personal observation, of the character of bed of the said stream, as to hollows or depressions; as to whether the same, or any part, is porous and capable of rapid absorption of water; as to sloughs or bayous and arroyos, so called, or any other features outside of evaporation which would have a tendency to detract from navigable capacity during a low stage of water and require to be filled before water coming downstream could be useful in tending to raise the river to a navigable height.

A. The river bottom and channel is all alike from the mouth of the river to Roma, a sandy or clay bottom; there is no place where the bottom is porous or capable of rapid absorption of the water. There are no bayous, sloughs, or arroyos that take the water from the river at ordinary low water. The arroyos and other outlets do not depreciate the waters, except during the flood season.

Interrogatory 9. Q. State whether, within your knowledge of the river, there have been any changes in cutting timber along the stream, or of any other nature than the diversion of the water for mining and irrigation purposes, tending to impair or reduce the navigability of the
178 stream in that part of the same where it was navigable when you first knew it.

A. No; none.

Interrogatory 10. Q. State whether, from your experience and knowledge of the said river, the construction of a dam and the storage or impounding of any considerable quantity of water and the diversion of the same for manufacturing purposes at a point across the same about 125 miles above El Paso, Texas, in the Territory of New Mexico, would have any influence upon the navigability of said river where it is now navigable; and if any, what that influence would be. Of this state fully, giving reasons.

A. I think it would. In my opinion a great amount of water withheld from the stream would naturally cause a shrinkage in the navigable portion of the river.

Interrogatory under Rule XXXIX. Q. Do you know or can you set forth any other matter or thing which may be of benefit or advantage to the parties at issue in this cause, or either of them, or that may be material to the subject of this your examination or the matters in ques-

tion in this cause? If yes, set forth the same fully and at large in your answer.

Answer. I do not.

179 And the cross-interrogatories propounded to the said witness at the time of the taking of the said deposition aforesaid, and his answers to the same, were thereupon read in evidence as follows, that is to say:

1. Q. How long have you resided at the place of residence named by you, and how long have you been engaged in the business named by you in your direct examination? Where and at what place have you resided other than at the places so named by you, and from what time to what time at each of such places, and what other occupations have you been engaged in, and from what time to what time have you been so engaged in the same?

A. Since 1847, or January, 1848; as pilot and captain, 1850 to 1874; at Bardstown, Kentucky, 1879 to 1883, and Mobile, Alabama, 1884, and all the rest of the time in Texas, 1850 down.

2. Q. Are either of you now, or have you been, in the employ of the United States in any capacity, or have you worked for or been in the employ of the International Boundary Commission between Mexico and the United States; and if so, in what capacity?

A. In 1851 I was a Government pilot; no.

3. Q. If, in answer to direct interrogatory number two, you undertake to state how long you have had personal observation of the Rio Grande, and over what part of it your personal observation has extended, please state how much of this river you have ever been over, and give the highest point on it you were ever on in person, and how often you
180 have been to such point in person.

A. I have been a licensed pilot and captain on the Rio Grande River from mouth to head of navigation at Roma, and have been at times as far up as Mier, Mexico. I have been as far up as Eagle Pass, but paid no attention to the river.

4. Q. If you have stated that you have been on the Rio Grande and given the highest point at which you have been, please state whether you have traveled over the intermediate points between such highest point and Brownsville, Texas, in person; and if so, please state what intermediate points you have traveled over and how often you have been over such intermediate points or any particular one of the same, describing such point.

A. I have been by river road as far as Laredo once. When I was at Eagle Pass it was by railroad.

5. Q. If you have stated that you have had personal observation of any portion of the Rio Grande, please give the length in miles, measuring by the course of the river, that you have had personal observation over, and the length of the same measured in a direct line between the highest point and the lowest point which has been covered by your observation.

A. To head of navigation at Roma, 250 miles; from Brownsville from Roma to mouth, 310 miles. By land, Roma to mouth, 165 miles.

6. Q. If you have stated that you have had personal observation of any portion of said river, please name the tributaries which said river

181 has on that portion of it covered by your observation, and also please state the distance from tributary to tributary, coming up the river, and whether such tributaries come in on the American or Mexican side of the river.

A. The Salado is about 50 miles above Rio Grande City. The San Juan is about 5 miles above. Both empty from Mexican side.

7. Q. If you have named any tributaries which come into the Rio Grande or have stated that you know of any tributaries that come into the same, please state all the facts which you know with reference to such tributaries, and state where they rise, how long they flow, whether the valleys of such tributaries are settled or unsettled, whether the waters of such tributaries are used for irrigation or mining purposes, how such tributaries are used for irrigation or mining purposes, how much land is cultivated on each tributary, and whether the waters of such tributary are used for irrigation or mining purposes.

A. Not informed.

8. Q. If you have stated that any of the waters of the tributaries of the Rio Grande are used for irrigation or mining purposes, please state how much of the same, and how long they have been so used, and state how much land is cultivated on each tributary by means of the water of the same, and what portion of the waters of such tributaries are used for irrigation or mining purposes.

A. A. Not informed.

182 9. Q. If you have stated that any part of the water, of such tributaries so flowing into the Rio Grande is used for irrigation or mining purposes, please state at what point on the same the waters are diverted from the streams for such purposes, and whether more or less water is now used on each of such tributaries, naming them, than was formerly used; and if so, when the increase or decrease in such use commenced and when it reached its maximum.

A. I did not state so; I cannot answer.

10. Q. If you have stated that you know of any of the tributaries of the Rio Grande, please state whether any dams or reservoirs are on any such streams, naming them, and if they are where the same are situated, and in or across what streams they are constructed, and when they were constructed, and whether any of the same were constructed by authority of the Mexican Government or by its permission, if you know.

A. I did not state so; I can't answer.

11. Q. If you have stated that you are acquainted with any of such tributaries of the Rio Grande, please state whether the flow of the same was or is constant or whether the same is spasmodic or intermittent, describing in detail in this respect each particular tributary; 183 and also state whether such streams are known as flood streams or perennial streams, and at what seasons of the year their floods generally come if they are flood streams, or if large floods come down the same, and how long such floods last, and what becomes of such floods.

A. The Salado and San Juan are running streams, but I have seen the mouth of the San Juan entirely closed—no flow of water at all. During the rainy season they are flood streams—from June to September liable to flood. They usually last about 4 or 5 days; they empty into the Rio Grande.

12. Q. If you have stated anything with reference to the navigation of the Rio Grande, please state the highest point on such river to which permanent navigation has ever extended.

A. To Roma, Texas.

13. Q. If you have stated that you know anything with reference to the navigation of the Rio Grande, please state how many boats were ever used and employed in such permanent navigation and how many are now used in the same, and what was the size and capacity of each of said boat or boats and how much water each thereof drew, and how often such boats ascended or descended such river during each year, and during what months during the year they made their ascents and descents.

A. In 1866, King, Kennedy & Co. owned ten steam boats, different sizes, from 100 up to 400 tons; they drew from 2 to 3½ light. We had no regular schedule time for running boats; went up and down during the whole year.

184 14. Q. If you have stated anything about any boats that navigated the Rio Grande at any time, please state whether such boats made their trips on such river on schedule time, and whether there were particular days of departure, which were adhered to, or whether the trips were only occasional, intermittent, and without knowledge on the part of the public or boatmen as to when the boats would arrive at or depart from terminal or intermediate points at which they touched.

A. The boats were advertised as to time of leaving; trips were not on schedule time.

15. Q. If you have stated that there ever was any navigation on the Rio Grande or is any navigation on it now, please state to what extent the points and people along said river depended upon such navigation for commercial purposes in the past, and to what extent they depend on the same at present, and as to whether they did in the past, or do now depend mostly on such navigation, or do they depend mostly upon freighting to and from railroads and commercial centers.

A. From Brownsville to Roma, in former years. Now, owing to the state of the river, they have to depend on carts, as the steamboat can seldom make a trip.

16. Q. Please state how long, in recent years, it would usually take a boat to ascend the Rio Grande from Brownsville, Texas, to Rio Grande City, and give the distance between Brownsville and Rio Grande City, when measured by the course of the river, and also the distance between said points along the usual traveled wagon road between the same.

A. In low water the present boat and only one here has taken over one month to reach Rio Grande from Brownsville—distance, 250 miles; by road, 120 miles.

185 17. Q. Have you not personally observed hulls or wrecks of old boats inside the bar at the mouth of the Rio Grande and up the course thereof and some distance therefrom?

A. There have been several boats wrecked on the bar at the mouth of river, but none inside the bar. There is one wreck about 5 miles from mouth, but it is on the land, not in the river.

18. Q. If you have said you observed any hulls or wrecks of old boats, as interrogated about, please state how these boats got there, and how far up the river their wrecks were observed by you, and state if you know how they came to be wrecked and when they were wrecked.

A. During the hurricane of 1867.

19. Q. As matter of fact, is it not true that such boats got into the river over the bar at the mouth thereof? And is it not a fact that many of them were cut in two in order to get them over the bar, and were afterwards abandoned by the parties undertaking to use them? And, if "yes," state how long ago this occurred, and the reason, if you know, why the boats were so abandoned.

A. No.

20. Q. If you have stated that you know anything of the character of such navigation, state whether or not vessels can come in from the Gulf of Mexico to the mouth of the Rio Grande at the present time, and how far up the river they can come from such Gulf. If you say they can not come into the mouth of such river or up the same, please state what prevents them from so doing.

A. Sand bars at bar prevents them from coming in, and sand bars in the river prevents them from coming up at low water.

21. Q. Is there not an obstruction at the mouth of the river Rio Grande which prevents boats from going into the same from the Gulf of Mexico; and if so, what is such obstruction?

A. Sand bars at low water.

22. Q. Do you know how much fall there is in the course of the river from Ringgold Barracks to the Gulf of Mexico per mile?

A. I don't recollect.

23. Q. What is the character of the current of the river Rio Grande immediately above its entrance into the Gulf of Mexico?

A. Usually slow during low water.

24. Q. Has the Rio Grande, for several miles from the mouth of the same, any appreciable current?

A. At high river a current of about 5 to 6 miles an hour.

25. Q. How far up the course of the river Rio Grande do the tides of the Gulf of Mexico affect the depth of the water in the river, and at what season of the year are these tides heaviest, and when at their heaviest how far up the river do they affect the current of the same?

A. I have noticed the tide at about 20 miles up the river probably 3 inches. Heaviest are spring tides.

26. Q. In describing the character of the navigation which you testified with reference to, please state what the average depth of the water near Brownsville is during the period when it is usually deepest, and how far up the river the depth continues the same.

A. During high water in the bends at and above Brownsville for considerable distance, there are about 20 feet, and on the crossing from 6 to 10 feet.

27. Q. At what period of the year is the depth of the river Rio Grande at Brownsville the greatest and at what period is it the shallowest, and for how long does the depth continue at its maximum and how long does it continue at its minimum?

A. Flood time, from June to September; lowest stage, March, April, and May. Usually, when it can be forded in many places.

28. Q. How shallow does the water get in the river at Brownsville?

A. Fordable.

29. Q. What character of bed has the river Rio Grande, and is the bed of the same permanent or is it shifting? Is it rocky or is it sandy? Are there any shallows in it or any sand banks in it?

A. The bed sandy, shifting lots of sand bars and shallows.

188 30. Q. If you have stated that there are either shallows or sand banks in the bed of the Rio Grande River, please state whether the same are below Rio Grande City; and if they are, if they are sufficient to in any way impede the navigation of the river; and if they are, for how long do they impede navigation.

A. Shallows are below Rio Grande City; during low stage of water they impede navigation.

31. Q. If you have stated what the condition of the bed or depth of the Rio Grande River is, please state how long such conditions have maintained within your knowledge.

A. To the best of my recollection, the last four years.

32. Q. Was there ever, at any time within your knowledge, any great permanency to the channel of the Rio Grande River, so far as depth and course are concerned, or was the depth and course of the same constantly changing?

A. The river was about the same from 1848 to 1874; the channel in many places changed after every rise.

33. Q. What effect, so far as changing the banks and the bed of the Rio Grande, would the heavy floods which came down the river have?

A. They cut away on one side and fill up on the other.

34. Q. How often during a trip up or down the river did the boat or boats which navigated the same ground upon these sand bars or shallows?

189 A. It depends on the stage of the river.

35. Q. Did any one of you ever navigate the river Rio Grande on the steamer known as the "San Ramon," or a steamer bearing that character of name? If so, was that the correct name of such steamer? And if not, please give its correct name.

A. I myself built the "Jose San Roman" in Pittsburg; her tonnage was about 400 tons. I brought her to the Rio Grande in 1866 and placed her in the King, Kennedy & Co. I have navigated her myself.

36. Q. If any of you have said that you have navigated the Rio Grande River in the steamer referred to in the last preceding interrogatory, state whether any of you have any personal recollection of a trip that such steamer made in the first half of the year 1873, when it took 42 days or thereabouts to go from Brownsville to Rio Grande City; and if so, state what caused it to take such length of time and how long it took such boat to go back down the river from Rio Grande City to Brownsville. And, if you state that it only required a few hours or a short time to do so, please state why such steamer was enabled to go back down the river more rapidly.

A. I was not captain of the boat at _____ time and have no means of getting at the data of _____; the company has long since dissolved.

37. Q. Do you remember that on the trip referred to in the last interrogatory, after said boat reached Rio Grande City, a flood came down the river and furnished sufficient water to float the boat back down the stream without touching on the bars or shallows?

A. I don't remember.

190 38. Q. In describing the navigation of the Rio Grande, please state whether the same was in the past ever a financial success; and if so, during what period it was financially successful and whether during the period it was so successful the navigation of the river was aided by either the Government of the United States or the Government of the Republic of Mexico.

A. Financial success until 1874, when the company sold out to the Rio Grande Railroad Company; navigation of the river was not aided by Mexico or the United States.

39. Q. Please state whether or not the navigation of the Rio Grande River at the present time is successful or otherwise.

A. It is not.

40. Q. Please state what the ruling price per hundred pounds, and also per ton, has been in the past, within your knowledge, for transportation between Brownsville and Rio Grande City, when carried by boat, and what the ruling price per hundred pounds and per ton river freight now brings on the steamboat "Bessie" between such points, and state whether there is any other steamboat plying the said river at the present time besides the "Bessie."

A. Freight was \$1.25 per 5 cubic feet or 200 pounds. I do not know what the freight is now; the "Bessie" is the only steamboat on river.

41. Q. In connection with the shipment of freight up and down the river Rio Grande, state whether there are any railroads which were built along the same for any distance on either the Mexican or American side, or which compete with the steamer "Bessie," and on which side of the river such railroads are built, and the termini of the same, and when the same were completed, and for what commercial purpose the same were built.

191 A. One on the Mexican side as far as San Miguel, 90 miles. It does not compete with the "Bessie," as merchandise can not be carried on Mexican side for American points on this side. Road was built to connect Monterey, but not completed.

42. Q. Please state where the goods and supplies that are shipped over any such railroad for the Rio Grande country are delivered to the road.

A. No supplies for Rio Grande are shipped on said road.

43. Q. Before this railroad was built, what method was there of getting shipments of freight into Rio Grande City from distant points, other than by navigation from Brownsville, and what was the cost per hundred pounds or per ton of getting such shipments by such means?

A. Freight has been carried by steamboat or carts, but very seldom by carts until the last few years, to Rio Grande City.

44. Q. Before such railroad was built, were not the rates for river freight greatly in excess of the rates put into effect by such railroad, and which now obtain on points along the Rio Grande River, and is not freight on goods and supplies shipped over the railroad and by boat to points along the river Rio Grande, now very much less than before such railroads were built. If so, was not the reduction in such freight rates caused by the construction of such railroad, and did not the construction of such railroad thereby cause the declining in the navigation of the river Rio Grande?

A. The building of this Mexican road had no effect whatsoever on the freight rates on this side.

45. Q. Could the navigation of the river from Brownsville up the stream be carried on after the construction of such railroad so as to successfully compete with the same in their freight rates between their termini and intermediate points along such river, and is not the decline of navigation on said river due to the inability of boats to compete with freight rates put in effect by such railroad?

A. Yes. Navigation could still be successfully carried on if the river was in condition of former years. The freight rates have had nothing to do with the running of the steamboat; the cause has been the river.

46. Q. Do you know the location of Camargo; and if so, how long have you known it, and was there ever any considerable amount of freight ascended such river on boats to Camargo to such point?

A. Yes; 1848; yes.

47a. Q. Was not Camargo a center for the supplying of interior points of Mexico even at great distance away therefrom? If it was, at what distance? Please state what sized place Camargo is now and what size place it was prior to the building of such road, and if it is a place of less size now. Please state if it is not also of less commercial importance than formerly. State, if you know, what has caused the decline of Camargo in population and commercial importance.

193 A. Most of the freight was landed opposite Roma on the Mexican side near Mier, Mexico, but large quantities were landed at Camargo for Monterey, Saltillo, and Durango. Hundreds of miles. I have not seen much difference in the size of Camargo since I first saw it. As to population, I don't know. It is on account of goods being carried through Laredo, Eagle Pass, and El Paso.

47b. Q. Was not this decline of Camargo due to the construction of the Mexican International Railroad, running between Laredo and the interior points of Mexico and connecting at Laredo with points in the United States? Does not such railroad now supply the interior points of Mexico which formerly contributed to the commercial importance of Camargo at cheaper rates of freight than could be had by navigation of the river?

A. I was to a certain extent. As to the freight charges, I can't say.

48. Q. If you have stated that any change has occurred in the commercial capacity of the Rio Grande River and have undertaken to state the nature of such change, please state whether such statement made were all founded upon personal observations made by you or are partly or wholly suppositions or theories.

A. Decrease of waters in the river has been the material cause, from my personal observation.

49. Q. If you have undertaken to state that there are any changes in the navigable capacity of the Rio Grande River, please state what the effects of such changes were in the increase or decrease of the flow of the river at Brownsville. How much depth, more or less, did the river take on at Brownsville, and what was the effect? How much depth was there, more or less, at intermediate points between Brownsville and Ringgold Barracks, naming each place of prominence at which the water became deeper or shallower? At what points did you

observe this effect? How often during the year when such effect was worked did you observe the same? How long did such effect continue?

A. It would be impossible to run the class of boats we owned now for more than six months during the year, and that during the flood seasons only.

50. Q. Do you know whether, in the year when such effect was first observable or within a year or so before the same was observable, there was any use commenced of any of the waters of any of the tributaries of the Rio Grande for purposes of irrigation or otherwise? If so, to what extent were such waters of such tributaries used?

A. I don't know to what extent the waters were used for irrigation.

51. Q. Did you know where the San Juan River empties into the Rio Grande? Does it come from the American or Mexican side? What was the amount of water contributed by the San Juan to the Rio Grande when you first knew the Rio Grande? Was it a considerable stream or an insignificant one? State how wide it was and about how deep and about the rapidity of its current where it emptied into the Rio Grande, if you know.

A. Yes; Mexican; considerable at flood time, insignificant at low water, for a distance of 4 miles up from its mouth, about 50 yards, at high river, at about 30 feet, 4 miles up at high water; current very rapid.

52. Q. If you have stated that there was any change in the navigable capacity of the Rio Grande, commencing at any period named by you, state whether during the year of such change, or subsequent thereto, the flow of said San Juan River was more or less than it has been in past years. And is the flow of such San Juan River more or less now than it was when you first became acquainted with the Rio Grande. If so, to what extent has it increased or decreased? State, if you know, the cause of such increase or decrease. Are its waters now used for irrigation at any point on its course?

A. I don't know; I can not say; I don't know.

53. Q. Please state if, before any change which you may have referred to in the navigability of the Rio Grande took place, you were acquainted with the amount of water flowing into the Rio Grande from the Salado, the San Antonio, the San Rodriguez, the Santiago, the San Phillippe, Devil's River, Goodenough, the Pecos, and the Concho. If so, state where each of those rivers, or any one thereof with which you may be acquainted, comes into the Rio Grande, with reference to the location of Rio Grande City; that is, the number of miles above such city the mouth of such rivers are. State about what was the size of each of those streams, the depth, width, and velocity of current at the point where the same entered into the Rio Grande. Please state which ones of said rivers were larger and which smaller than the others; also whether there had been any decrease, at the time of any change in the navigability of the Rio Grande occurred, in the flow of either of such streams. If so, which decreased in its flow from the time when you first knew the same up to the time when the navigable capacity of the Rio Grande underwent any change.

A. I have answered as to the Salado and San Juan. I don't know the other tributaries.

54. Q. As matter of fact, were you ever personally at the mouth of any of these streams? If so, please name the same and state when and often you were there previous to such change in the navigable capacity of the Rio Grande; also, how often you have been there subsequent to such change in its navigable capacity.

196 A. At San Juan many times. None.

55. Q. If, in answer to the foregoing question, you should state that there has been any decrease or increase in the amount of water flowing in any of the tributaries above named since the time when you first know the same, please state, if you know, what has caused such increase or decrease.

A. I did not so state.

56. Q. Do you know that the flow of such tributaries and of the Rio Grande varies any, changes in accordance with the amount of rainfall which occurs from year to year over the watershed drained by such Rio Grande and its tributaries?

A. I presume there is; I don't know extent.

57. Q. Do you not know that for a great many years past the rainfall in the watersheds adjacent to the Rio Grande and these tributaries in that section of Texas and Mexico has decreased and is now less than it was in the years immediately preceding 1887 and 1888?

A. I don't know of my knowledge.

58. Q. As matter of fact, has there not been a drouth in that section of the country since in the eighties and has not this drouth resulted in the death of the greater portion of cattle and sheep, and even during periods necessitated the removal of portions of the population in various places along the river?

Q. There has been drouths.

59. Q. As matter of fact, is there now one-half as much rainfall as there was in that section of country in such former years?

A. I don't know.

60. Q. If in answer to the sixth direct interrogatory you stated that you know anything by personal observation as to the colors of the water of any stream which flows into the Rio Grande between its mouth at the Gulf of Mexico and the city of El Paso, Texas, please state how you know the same.

A. I know that the San Juan is a dirty milky color.

61. Q. At what points above the head of navigation did you ever observe personally the colors of the waters of any such tributary and how many times did you ever observe the color of such water above the head of navigation?

A. I only know the San Juan which is below the head of navigation.

198 62. Q. If in answering interrogatory number six you have stated that you knew the color of any water, did you answer from having seen the same during your navigation of the river and after such water had mingled with the waters of such stream where navigable, or did you get your idea of the color from having seen it come out of the tributary before it had entered the Rio Grande?

A. Before and after.

63. Q. Can you tell the color of the water of each of the following

tributaries, respectively: San Juan, Salado, San Antonio, San Rodriguez, Santiago, San Phillipe, Devils River, Pecos, and Concho? If so, please state the color of each one separately.

A. No; the San Juan only.

64. Q. What is the difference between the color of the Pecos and of the Concho? What is the difference between the color of the Concho and of the Rio Grande before the Concho empties into it?

A. Don't know.

65. Q. If you undertake to tell the color of each one of these tributaries, state how you know the same, and whether your statement is derived from hearsay or from actual observation.

199 A. As to the San Juan, personal observation.

66. Q. Were you ever at El Paso, Texas? If so, when and how often? Did you ever see the Rio Grande at such place? If so, what was the color of the Rio Grande at that place?

A. Never.

67. Q. Do you know that the color of any tributary of this stream is liable to vary and change greatly from time to time in accordance with the droughts, the light floods, or the excessive floods, or even the particular dry arroyos through which such floods from time to time enter such tributaries?

A. No.

68. Q. Do you know of a heavy rainfall comes upon any particularly timbered section of a watershed of one of these tributaries making a flood in the tributary itself, that the color is liable to be very greatly different from the color of a flood in such tributary caused by an excessive rainfall in the nontimbered parts of the watershed of such tributary?

A. No.

200 69. Q. If you say that you knew the color of the floods of the Pecos River which empty into the Rio Grande, please state whether in recent years there has been any change in the color of the Pecos floods.

A. I did not so state.

70. Q. Witness Kelley is asked whether he is the same man who made an affidavit to be used in the trial of the injunction which was granted in this case in 1896 or 1897, and whether it is true that he therein stated that he had not observed or heard remarked on the river any reference to waters which, from their color, appeared to come from the Upper Rio Grande itself since in the early eighties? In this connection, said witness is asked to state when he last observed flood waters while on the navigable part of the Rio Grande, which from its color he judged to come from the Upper Rio Grande.

A. I don't know.

71. Q. If it is true that Witness Kelley has not observed any flood waters on the navigable portion of the Rio Grande which from their color he judged to come from the Upper Rio Grande, then is it not true, according to his observation, that the flood waters of the Rio Grande have not contributed materially to the navigation of that stream since in the early eighties?

A. I don't know.

201 72. Q. For how long a period during each year, and at what time of the year, is the amount of the water in the Rio Grande, in

its navigable parts, substantially increased by flood flows coming in from its tributaries?

A. From June to September; sometimes later.

73. Q. During such period, to what extent is that navigable depth of the Rio Grande increased, and how much is such stream widened?

A. In regular channel for 6 to 20 feet; it widens in some places miles.

74. Q. When such floods come are the waters confined within the banks, or do such floods rise over the banks of the Rio Grande, and deposit waters in lagoons, lakes, and depressions?

A. No; yes.

75. Q. What portion of any particular flood which may in a week or ten days pass Ringgold Barracks will reach Brownsville? Does the amount of water which will reach Brownsville from such flood lasting, say a week, at the head of navigation constantly decrease as it comes down the channel and deposit itself in such bayous and lakes or is it absorbed by the sand?

A. About 4 to 5 days; yes.

76. Q. Have you any knowledge or information as to how far below El Paso water will run in the channel of the river before it is absorbed and taken up by the sand when, for five days or ten days or thirty days, at El Paso such water ran one foot deep and fifty feet wide, or when it ran at any other particular depth or width for any given period of time at El Paso?

A. I have no knowledge.

77. Q. Do you know what would be the effect of a flood at El Paso, Texas, which ran a thousand cubic feet per second for one day or ten days or twenty days or thirty days, so far as increasing the depth and velocity of water in the river at Fort Quitman, Presidio del Norte, or the mouth of the Pecos, or Eagle Pass, or Rio Grande City, or Brownsville, is concerned?

A. No.

78. Q. Do you know how much the river would be raised at Rio Grande City by a flood passing El Paso, Texas, amounting to 15,000 cubic feet of water per second, and running for ten days at that rate?

A. No.

79. Q. Do you know, in the month of May, 1897, whether any flood entered the Rio Grande from either the San Juan, Salado, San Antonio, the San Rodriguez, Santiago, San Philipe, Devil's River, Pecos, or the Concho? If you , which one of these streams do you know of any flood entering the Rio Grande from during that month?

A. I don't remember.

80. Q. Have you any knowledge as to whether any flood came from either one of those tributaries into the Rio Grande during that month? Please state which one of them you do not know with reference to?

A. No.

81. Q. Do you know whether there was a flood from either one of those streams entering into the Rio Grande during the present calendar year? If so, which one of them had a flood, and what month did the same occur in? If you do not know with reference to any one of the same during the present year, please state which one you do not know with reference to.

A. I was absent all summer and don't know.

82. Q. In interrogatory seven, you are asked to state your full knowledge of the effect of the ordinary flow of water and of the flood waters which comes from above El Paso. As a matter of fact, have you had any personal observation which will enable you to state just what regular flow or flood flow comes from El Paso or above there, or are you simply depending upon hearsay, as to that?

A. I know nothing about the Salado.

83. Q. Do you know anything about the amount of waters which have flowed regularly by El Paso since 1880 or previous thereto?

A. No.

84. Q. What was the width and the depth of the water flowing in the Rio Grande, passed El Paso, in 1880? What was it in 1885? What was it in 1890? What was it in 1895? What was it in 1899?

204 A. I don't know.

85. Q. Do you know during what years between those dates, or previous to those dates, the river has been absolutely dry at El Paso for any considerable number of months in the year; and if so, what months?

A. No.

86. Q. Do you know what flood flows passed El Paso in the years above named? Do you know how long the flood of 1897 at El Paso lasted?

A. No.

87. Q. If you have testified as to any flood flows passing by El Paso during any of these years, state whether you were at El Paso and saw them, or whether you were simply guessing that they passed El Paso because you saw them at some point further down the river?

A. I was not at El Paso.

88. Q. If you saw any floods down the river at any navigable part thereof during any of these years, is it not possible that they may have come from some of the tributaries of the Rio Grande above named?

A. Yes.

89. Q. Is it not possible that such floods may have come from heavy rains along the Rio Grande below El Paso?

205 A. Yes.

90. Q. How far above El Paso were you ever? Did you ever come up the Rio Grande from the head of navigation to El Paso overland and observe the flow of the Rio Grande along its entire course?

A. I never was at El Paso.

91. Q. If, in answer to interrogatory eight, you state that you have personally observed the bed of the said Rio Grande as to hollows or depressions, and that the same is porous and capable of large absorption, or that the same has sloughs or bayous and arroyos, which have a natural tendency to detract from its navigable capacity during a low stage of water, and which have to be filled before the river can be raised by floods and increased flows, please state what ultimately becomes of the water which is consumed by such porous character of soil, or which runs into such sloughs or bayous or arroyos.

A. The bottom and channel is alike from Roma to mouth, a clay or sandy bottom; there is no place where there is porous bottom; the bayous and, etc., take no water from the river except at flood stage.

92. Q. Does this water stand in such sloughs and bayous until it is absorbed by the soil or by evaporation?

A. Yes.

206 93. Q. If you state that you have observed such sloughs and bayous, state how far up the river you have observed the same, and whether practically the same condition does not continue up the stream to El Paso and north of that place.

A. I have seen them as far as Roma.

94. Q. If you state that such sloughs and bayous check and hold this water and such waters sink into the sand and are absorbed, please state if these facts would not tend to constantly decrease any floods which might pass El Paso, and so decrease the same as to practically consume it, so that it would not substantially aid navigation where said river is navigable?

A. When the river falls, the water in a measure returns gradually lagoons, arroyos, &c. A flood coming from El Paso or otherwise would naturally help navigation.

95. Q. If, in answer to interrogatory eight, you state that the flood waters of the river are necessary to fill bayous and depressions in order to keep the regular current flowing down, then please state whether, in your opinion, that result is the greatest good produced by these floods. As matter of fact, the floods are treacherous, are they not?

A. The waters running back for some time into the river helps to keep the river up, and therefore helps navigation; some floods are treacherous, not all.

96. Q. Are you acquainted with the steamer "Bessie;" and if so, what relation towards it do any of you bear? Can the steamer "Bessie" come up the Rio Grande against the flood coming down the stream with any considerable force?

A. Yes. None. Yes.

97. Q. It is a fact, is it not, that it is exceedingly trying and dangerous to the safety of the vessel and the progress of the same to undertake to navigate the river depending upon the flood flow?

A. No.

98. Q. It is true, is it not, that if the steamer comes up the Rio Grande, during a flood, it is exceedingly liable to be stranded by reason of the subsidence of the flood before the steamer reaches its destination?

A. No.

99. Q. Can the steamer "Bessie" come up the Rio Grande at all during the heaviest flood flows which occur along its navigable course? Is it not true that she can better navigate when the floods are not greatest, and that if the excessive floods were lessened she would make quicker and safer trips?

A. At times in very high river she might have to tie up for a few days until the river commenced falling. Yes, she could; yes.

208 100. Q. How many irrigating ditches do you know of from the vicinity of El Paso to Brownsville, Texas? If any, where are the same located and how much of the Rio Grande do they divert and on which of the river are they, on the American or Mexican side?

A. I don't know of any.

101. Q. In direct interrogatory tenth you are asked what would be

the effect of storing water 125 miles above El Paso, Texas, so far as the navigability of said river is concerned. Do you know a point named as Elephant Butte, about 125 miles above El Paso, Texas? Were you ever at such point? Do you know whether the bed of the proposed reservoir at Elephant Butte is sandy, or whether the river at that point flows through a rocky cañon? When were you there?

A. I don't know Elephant Butte. I think naturally that the withholding of large quantities of water from flowing would affect the navigability of the river.

102. Q. Do you know the character of the bed of such stream below Elephant Butte down to a point of rocks just above Las Cruces, New Mexico? What is the character of the bed of such stream at such point?

A. No.

103. Q. Have you ever been connected with an irrigation company or had any experience in the use of waters of reservoirs? If so, where, and what experience have you had? How large was the reservoir with which you had such experience?

A. No.

209 104. Q. Do you know what per cent of the waters which would be impounded by a dam thrown across the river 125 miles above El Paso, Texas, would pass off by evaporation?

A. No.

105. Q. Suppose such dam held water fifty feet deep, ten miles long, and a mile wide; what amount, in depth, of such water, in such place, would pass off by evaporation, and how do you know that?

A. I don't know.

106. Q. Do you know how much such water, when being let out of such dam and used in the neighbourhood thereof for irrigation without being taken out of the valley of the Rio Grande, would return to the Rio Grande and contribute to its flow? If so, what per cent would so return? What would become of the balance of the water? What part would pass off in *vagatation*? What per cent of what is lost would be due to absorption?

A. No.

107. Q. What would be the effect upon the flow of the river at its navigable parts if the water of the stream so impounded at this point 125 miles above El Paso, and used as is asked in direct interrogatory tenth, for manufacturing purposes, and let back into the river into such quantities as would be sufficient to supply all ordinary manufacturing purposes which might be located thereunder?

A. I don't know; it is according to the amount of water returned into the river.

210 108. Q. As matter of fact, have you sufficient technical knowledge to be certain what the effect of empounding the waters of the Rio Grande 125 miles above El Paso and using them along the banks of the stream for irrigation would have upon the flow? Do you not know it to be a fact that such acts would tend to equalize the average flow of such river?

A. No.

109. Q. If 500 cubic feet of water per second were taken out of a reservoir constructed 125 miles above El Paso, how much of it would

reach El Paso and how much of it would be lost in the bed of the river itself by absorption and evaporation?

A. I don't know.

110. Q. If five hundred feet of water reached El Paso, Texas, traveling down the bed of the stream, after having been turned out of the reservoir 125 miles above El Paso, how much of it would be diverted out of the stream by the Juarez dam, at El Paso, and flow off down the Juarez Canal on the Mexican side, and how much of it would be diverted by the El Paso wing dam and flow down to El Paso?

A. I don't know.

111. Q. If you have stated that the flood of waters of the upper Rio Grande ever reached the lower portion of the river, please state at what season of the year the floods usually come down the river.

A. From June to September.

211 112. Q. If any of the flood waters from El Paso or above ever come down the Rio Grande, and you have undertaken to state that there are any sloughs, bayous, or arroyos in the bed of the stream which such flood waters might fill up, or that such flood waters do actually fill up the same, please state when the flood waters fill the same and how long the waters remain therein. State if it is not a fact that even if enough flood waters come down to fill the sloughs, bayous, and depressions in the bed of the Rio Grande that such flood waters would and do evaporate or disappear before the perennial flow of the Rio Grande comes down the same.

A. There are sloughs, lagoons, &c., which do not affect the water in the river except at flood time. Sometimes it remains in the "Resacas" during the whole year.

113. Q. Have not the floods of the Rio Grande at Presidio, Rio Grande City, Laredo, Eagle Pass, and Brownsville been greater during the present year than they have been for many years previous? If you answer that they have not, please state during what years within the past ten years, and during what month in such years, there have been heavier floods than during the present year. In your answer name each year during the last ten years and the month or months of each year during which the floods have been greater than they have during the present year at the points mentioned. And state if you know that the highest water reached by the river at each of such points during the present year, and the time of such high water, and the highest water at each of said points during the past ten years.

A. I can't say; have been absent all summer and most of the fall.

212 114. Q. With whom have you conversed about giving testimony in this case? Were you asked to come in person at the trial of this case, and give your personal evidence, by anyone; and if so, whom? When did you first see, or have read to you the interrogatories and cross-interrogatories which have been propounded to you and who first showed them to you and told you of the same?

A. Mr. W. P. Sutton stated to me that I would be a witness. I saw the direct and cross interrogatories to-day for the first time, in the office of the U. S. commissioners, where I went upon notice served on me this 9 a. m. by said commissioner.

115. Q. Have you read over such interrogatories or cross-interrogatories with anyone, previous to having the same propounded to you by

the officer taking your deposition? If so, with whom did you read over the same?

A. No.

116. Q. Has anyone written out for you or furnished you with a written answer or suggested a written answer which would be suitable to any of the interrogatories or cross-interrogatories which have been submitted to you? If so, who has done so?

A. No one.

117. Q. Has anyone suggested any portion of the answers or any portion of an answer to this interrogatories? If so, whom?

A. No one.

213 118. Q. Do you speak English, or have the questions been translated to you? If so, have your replies thereto been translated into English before being written down?

A. I speak and read English.

119. Q. In whose presence and where and on what day have you given this answers? Name everyone who has been present while you were giving this testimony, listening to the same. Has any attorney been present? If so, give his name and state whether he was the attorney for plaintiff or for the defendant.

A. In presence of U. S. commissioner only, this 2nd day of December, A. D. 1899 (none present, no attorney). No one listening.

120. Q. Has anyone representing the United States Government or pretending to so represent it been present at the taking of this testimony? If so, state his name.

A. No one.

(Signed)

R. DALZELL.

214 WILLIAM KELLY, a witness on behalf of the United States, living at Brownsville, Cameron County, Texas, having previously given his testimony by deposition, taken on direct and cross interrogatories, the said deposition was then read in evidence as follows:

Interrogatory 1. Q. What is your name, age, residence, and occupation?

A. My name is William Kelly; age 59 years; Brownsville, Texas; banker and steamboat owner.

Interrogatory 2. Q. When did you first see the Rio Grande? How long have you had personal observation of it, and over what part of it has your personal observation extended? State fully.

A. 1865. I have had management, control, and ownership until now.

Interrogatory 3. Q. State what you know, if anything, by personal experience, if you had any, as well as by personal observation, of the navigation of said river, the character of such navigation, the amount and extent thereof, and the time when such experience and observation began and ceased.

A. Personal observation and reports of officers of steamboats; the navigation of the Rio Grande has been performed in that time wholly by steamboats of from 100 to 400 tons burden; from 1865 to 1874 the actual tonnage running on the river averaged nine steamboats, aggregating about 2,000 tons. This included the tonnage on both sides of the river; my experience has continued from 1865 to date.

Interrogatory 4. Q. State what you know from personal observation and experience, or either, concerning the navigable capacity of said river when you first knew of the same, mentioning that part of its course which has a navigable capacity and what portions of the year it was
 215 navigable, naming the months or parts of months, according to your best recollection.

A. From 1865 to 1874 the river was navigable from mouth to Brownsville by boats drawing 4½ to 5 feet of water; from Brownsville to Roma it was navigable about 10 months in the year for boats not drawing over 4 feet.

Interrogatory 5. Q. State from your personal observation or experience, or both, whether since your first knowledge, if you have any, any change has occurred in the navigable capacity of said river, and as nearly as you can the year when such change became observable; the nature of such change, if any; its extent, and any circumstances which from time to time occurred to impress such change upon your mind.

A. The navigable capacity of the Rio Grande, from my observation, has been gradually decreasing since 1879. The decline did not affect the operation of the boats then running on it to any great extent until 1884. Occasionally, in seasons of protracted drouth, we have had extremely low water for a month or more, but so long as rises from the head waters reached it the navigation of the river was but slightly impaired.

Interrogatory 6. Q. State what, if anything, you know by personal observation of the character of the streams which flow into the Rio Grande between its mouth at the Gulf of Mexico and the city of El Paso, Texas, as to color of the waters of the same, if they have any peculiar colors; the extent of the waters they contribute to the Rio Grande; the time of the year when each is accustomed to furnish the greatest volume, and any other facts or circumstances within your personal knowledge affecting the navigable capacity of the river.

A. The principal streams of which I have any personal knowledge flowing into the Rio Grande are San Juan, which falls into the river on the Mexican side below Camargo; the Alamo on the Mexican side, which falls into the river below Mier; the Salado, which also falls in on the Mexican side near Guerrero, Mexico, and the Pecos on this side.

216 The first three named are comparatively small streams, liable to sudden freshets which only affect the water of the Rio Grande for a few days at a time; the rise and fall is irregular, depending largely on the rains. The Pecos furnished a large volume of water to the Rio Grande and frequently affected its navigation for many weeks at a time; the difference between the color of these waters is difficult to describe, but perfectly apparent to persons familiar with them. In my experience the main dependence of the lower river up to about 1886 was the water coming down the main stream. This was commonly known by river men as El Paso water.

Interrogatory 7. Q. State what, if anything, you know of the color, nature, and extent of the waters of the Rio Grande at and above El Paso, Texas; and in this connection state what you know, or have known from year to year since your knowledge began, of the effect of the flood waters or so-called torrential flow; as to the time of the year when the same became manifest in navigation, and also state the same of the ordinary

flow of waters or so-called perennial flow; all of this as far as your knowledge will permit as to waters coming from and above El Paso.

A. Personally I know nothing of the river above El Paso previous to the establishment of telegraph lines along the river. We depended for advice of a raise in upper river on mail communication. My observation is that it takes a rise of 10 feet or over at El Paso about 16 days to reach Brownsville. The color of such water differs from other tributaries, it being of a red'ish cast, and also in this that the El Paso rises used to keep the lower river supplied with water for a considerable time, while the rises from the tributaries frequently caused overflows in the lower river, but were of shorter duration. El Paso rises occurred usually twice a year, in the spring and fall.

Interrogatory 8. Q. State what you know, from personal observation, of the character of bed of the said stream as to hollows or depressions; as to whether the same or any part is porous and capable of rapid absorption of water; as to sloughs or bayous and arroyos, so called, or any other features outside of evaporation which would have a tendency to detract from navigable capacity during a low state of water and require to be filled before water coming downstream could be useful in tending to raise the river to a navigable height.

A. The bed of the Rio Grande in its navigable parts runs mostly through an alluvial soil, frequently changing its location by freshets and sudden rises from a hundred to 2,000 yards. The banks are absorbent. The loss by such absorption has to be replaced by water coming downstream.

Interrogatory 9. Q. State whether, within your knowledge of the river, there have been any changes in cutting timber along the stream, or of any other nature than the diversion of the water for mining and irrigation purposes, tending to impair or reduce the navigability of the stream in that part of the same where it is navigable when you first knew it.

A. There have been no changes in the navigable portion of the river from the causes mentioned in this interrogatory.

Interrogatory 10. Q. State whether, from your experience and knowledge of the said river, the construction of a dam and the storage or impounding of any considerable quantity of water, and the diversion of the same for manufacturing purposes at a point across the same about 125 miles above El Paso, Texas, in the Territory of New Mexico, would have any influence upon the navigability of said river where it is now navigable, and, if any, what that influence would be. Of this state fully, giving reasons.

A. In my opinion, and from my knowledge and experience of the navigable portion of the river, any obstruction to the natural flow of water down the main stream of the Rio Grande would have a serious effect upon the navigability of the river, and I attribute its present condition of low water, and the constantly decreasing volume of water for several years past, to the impounding or cutting off of the supply from the head waters. The present unnavigable condition of the stream is, in my opinion, due to this cause.

Interrogatory under Rule XXXIX. Q. Do you know, or can you set forth, any other matter or thing which may be of benefit or advantage to the parties at issue in this cause, or either of them, or that may be

material to the subject of this, your examination of the matters in question in this cause? If yes, set forth the same fully and at large in your answer.

A. I know of nothing further.

219 And the cross-interrogatories propounded to the said witness at the time of the taking of the said deposition aforesaid, and his answers to the same, were thereupon read in evidence as follows, that is to say:

1. Q. How long have you resided at the place of residence named by you, and how long have you been engaged in the business named by you in your direct examination? Where and at what place have you resided other than at the places so named by you, and from what time to what time at each of such places, and what other occupations have you been engaged in, and from what time to what time have you been so engaged in the same?

A. 35 years; engaged in steamboating. Cameron County and mouth of Rio Grande River.

2. Q. Are either of you now, or have you been, in the employ of the United States, in any capacity, or have you worked for, or been in the employ of, the International Boundary Commission between Mexico and the United States; and if so, in what capacity?

A. From 1862 to 1865 I was in the military service of the United States. I had been for 20 years a United States commissioner and am now a referee in bankruptcy. No.

3. Q. If, in answer to direct interrogatory number two, you undertake to state how long you have had personal observation of the Rio Grande and over what part of it your personal observation has extended, please state how much of this river you have ever been over, and give the highest 220 est point on it you were ever on in person, and how often you have been to such point in person.

A. I have been frequently over it from mouth to Roma, which has been practically the head of navigation. I can not say how often I have made freight trips between the points named in steamboats.

4. Q. If you have stated that you have been on the Rio Grande and given the highest point at which you have been, please state whether you have traveled over the intermediate points between such highest point and Brownsville, Texas, in person, and if so, please state what intermediate points you have traveled over, and how often you have been over such intermediate points or any particular one of the same, describing such point.

A. My travels have been on river to all parts which were navigable.

5. Q. If you have stated that you have had personal observation of any portion of the Rio Grande, please give the length in miles, measuring by the course of the river, that you have had personal observation over, and the length of the same measured in a direct line between the highest point and the lowest point which has been covered by your observation.

A. I estimate the distance from the mouth to Roma, the head of navigation, by the course of the river, to be 350 to 380 miles; the land distance between the said points is 170.

6. Q. If you have stated that you have had personal observation of

any portion of said river, please name the tributaries which said river has on that portion of it covered by your observation, and also
 221 please state the distance from tributary to tributary, coming up the river, and whether such tributaries come in on the American or Mexican side of the river.

A. The San Juan, Alamo, both on the Mexican side of river; the distance between the mouth is about 30 miles by land and 50 by water.

7. Q. If you have named any tributaries which come into the Rio Grande, or have stated that you know of any tributaries that come into the same, please state all the facts which you know with reference to such tributaries, and state where they rise, how long they flow, whether the valleys of such tributaries are settled or unsettled, whether the waters of such tributaries are used for irrigation or mining purposes, how such tributaries are used for irrigation or mining purposes, how much land is cultivated on each tributary, and whether the waters of such tributary are used for irrigation or mining purposes.

A. Both the tributaries named run through sparsely settled country, and are little used for mining, agriculture, or other purposes. The principle branch of the San Juan rises near Monterey; the Alamo is a short stream.

8. Q. If you have stated that any of the waters of the tributaries of the Rio Grande are used for irrigation or mining purposes, please state how much of the same and how long they have been so used, and state how much land is cultivated on each tributary by means of the water of the same, and what portion of the waters of such tributaries are used for irrigation or mining purposes.

A. Answered in reply to previous interrogatory.

222 9. Q. If you have stated that any part of the water of such tributaries so flowing into the Rio Grande is used for irrigation or mining purposes, please state at what point on the same the waters are diverted from the streams for such purposes, and whether more or less water is now used on each of such tributaries, naming them, than was formerly used; and if so, when the increase or decrease in such use commenced and when it reached its maximum.

A. I am not aware of any material diversion of the waters of the streams previously named for any purpose.

10. Q. If you have stated that you know of any of the tributaries of the Rio Grande, please state whether any dams or reservoirs are on any such streams, naming them; and if there are, where the same are situated, and in or across what streams they are constructed, and when they were constructed, and whether any of the same were constructed by authority of the Mexican Government or by its permission, if you know.

A. I don't know. I have not heard of any dams or reservoirs on either stream.

11. Q. If you have stated that you are acquainted with any of such tributaries of the Rio Grande, please state whether the flow of the same was or is constant, or whether the same is spasmodic or intermittent, describing in detail in this respect each particular tributary; and also state whether such streams are known as flood streams or perennial streams, and at what seasons of the year their floods generally
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come, if they are flood streams, or if large floods come down the same, and how long such floods last, and what becomes of such floods.

A. They are both known as flood streams, and floods come at irregular period and last from one hour to three days.

12. Q. If you have stated anything with reference to the navigation of the Rio Grande, please state the highest point on such river to which permanent navigation has ever extended.

A. Permanent navigation has had Roma for its highest point. Steamboats have frequently gone up to Mier, Mexico, and at one occasion reached Laredo.

13. Q. If you have stated that you know anything with reference to the navigation of the Rio Grande, please state how many boats were ever used and employed in such permanent navigation and how many are now used in the same, and what was the size and capacity of each of said boat or boats, and how much water each thereof drew, and how often such boats ascended or descended such river during each year, and during what months during the year they made their ascents and descents.

A. Within my experience we have had ten boats at one time navigating the river; at present there is but one. The boats were from 100 to 400 tons capacity, and drew from 3 to 5 feet of water. Previous to 1888 the boats ran all the year.

224 14. Q. If you have stated anything about any boats that navigated the Rio Grande at any time, please state whether such boats made their trips on such river on schedule time, and whether there were particular days of departure, which were adhered to, or whether the trips were only occasional, intermittent, and without knowledge on the part of the public or boatmen as to when the boats would arrive at or depart from terminal or intermediate points at which they touched.

A. The trips were constant, boats arriving and departing as rapidly as the boats were able to make the trips; schedule time was not observed. The time occupied in any voyage depended generally how deeply the boat was loaded.

15. Q. If you have stated that there ever was any navigation on the Rio Grande or is any navigation on it now, please state to what extent the points and people along said river depended upon such navigation for commercial purposes in the past, and to what extent they depend on the same at present, and as to whether they did in the past or do now depend mostly on such navigation, or do they depend mostly upon freight-ing to and from railroads and commercial centers.

A. Up to about 1890 the people on both sides of the Rio Grande, from Brownsville to Roma, depended for their supplies and commercial wants on steamboat navigation; at present, on account of the unnavigability of the river, they obtain their supplies by other means.

16. Q. Please state how long, in recent years, it would usually take a boat to ascend the Rio Grande from Brownsville, Texas, to Rio Grande City, and give the distance between Brownsville and Rio Grande City, when measured by the course of the river, and also the distance between said points along the usual traveled wagon road between the same.

A. Up till 5 years ago the average steamboat time to Rio Grande City from Brownsville was 3½ days; the distance by river was about 300 miles, and 120 by land.

225 17. Q. Have you not personally observed hulls or wrecks of old boats inside the bar, at the mouth of the Rio Grande, and up the course thereof and some distance therefrom?

A. At the mouth of the Rio Grande is the wreck of a boat lost there during the war. In the stream two boats have been lost during the last 25 years, 4 or 5 boats have been driven out of the river during hurricanes and wrecked a short distance from the banks.

18. Q. If you have said you observed any hulls or wrecks of old boats, as interrogated about, please state how these boats got there, and how far up the river their wrecks were observed by you, and state if you know how they came to be wrecked and when they were wrecked.

A. Answered in the previous interrogatory.

19. Q. As matter of fact, is it not true that such boats got into the river over the bar at the mouth thereof? And is it not a fact that many of them were cut in two in order to get them over the bar, and were afterwards abandoned by the parties undertaking to use them? And if "yes," state how long ago this occurred, and the reason, if you know, why the boats were so abandoned.

A. Never heard of the circumstance mentioned in this interrogatory, except that (all boats that) all the boats that got there came over the bar.

20. Q. If you have stated that you know anything of the character of such navigation, state whether or not vessels can come in from the Gulf of Mexico to the mouth of the Rio Grande, at the present time, and how far up the river they can come, from such Gulf. If you say they
226 can not come into the mouth of such river or up the same, please state what prevents them from so doing?

A. A railroad from Brownsville to the Gulf at Point Isabel makes the navigation of the river to the mouth unnecessary; hence there is no traffic into the mouth of the river.

21. Q. Is there not an obstruction at the mouth of the river Rio Grande which prevents boats from going into the same from the Gulf of Mexico; and if so, what is such obstruction?

A. No material change at the mouth of the river for many years.

22. Q. Do you know how much fall there is in the course of the river from Ringgold Barracks to the Gulf of Mexico per mile?

A. I do not.

23. Q. What is the character of the current of the river Rio Grande immediately above its entrance into the Gulf of Mexico?

A. Depends upon the height of river.

24. Q. Has the Rio Grande, for several miles from the mouth of the same, any appreciable current?

A. For 4 or 5 miles from the mouth the Rio Grande is affected by the tide from the Gulf; otherwise the current depends upon the height of the river.

25. Q. How far up the course of the river Rio Grande do the tides of the Gulf of Mexico affect the depth of the water in the river, and at what season of the year are these tides heaviest, and when at their
227 heaviest, how far up the river do they affect the current of the same?

A. The tides differ very slightly all the year around.

26. Q. In describing the character of the navigation which you testified with reference to, please state what the average depth of the water near Brownsville is during the period when it is usually deepest, and how far up the river the depth continues the same.

A. The depth of the Rio Grande changes in every bend; at low water the river is full of shoals and banks; at high stage of the average depth of the water is 20 feet.

27. Q. At what period of the year is the depth of the river Rio Grande at Brownsville the greatest, and at what period is it the shallowest, and for how long does the depth continue at its maximum, and how long does it continue at its minimum?

A. Water in Rio Grande not governed by seasons, depends on the supply of main streams and its tributaries.

28. Q. How shallow does the water get in the river at Brownsville?

A. In recent years it is often fordable except a channel of 15 or 20 feet in width.

29. Q. What character of bed has the river Rio Grande, and is the bed of the same permanent, or is it shifting? Is it rocky or is it sandy? Are there any shallows in it or any sand banks in it?

A. Shifting sandy bed, full of shallows at low water.

228 30. Q. If you have stated that there are either shallows or sand banks in the bed of the Rio Grande River, please state whether the same are below Rio Grande City, and if they are, if they are sufficient to in any way impede the navigation of the river, and if they are, for how long do they impede navigation.

A. The shallows are due to want of water in the stream, and of course impede navigation.

31. Q. If you have stated what the condition of the bed or depth of the Rio Grande River is, please state how long such conditions have maintained within your knowledge.

A. The present condition of the water in the Rio Grande has continued without material change for three years.

32. Q. Was there ever, at any time within your knowledge, any great permanency to the channel of the Rio Grande River, so far as depth and course are concerned, or was the depth and course of the same constantly changing?

A. The channel is always shifting, but until the 3 years past been navigable for 10 months of the year.

33. Q. What effect, so far as changing the banks and the bed of the Rio Grande, would the heavy floods which came down the river have?

A. Heavy floods make cut-offs.

34. Q. How often during a trip up or down the river did the boat or boats which navigated the same, ground upon these sand bars or shallows?

229 A. Depended somewhat on what the boat was drawing and stage of water.

35. Q. Did any one of you ever navigate the river Rio Grande on the steamer known as the "San Ramon," or a steamer bearing that character of name? If so, was that the correct name of such steamer? And if not, please give its correct name.

A. Yes; name was "Jose San Roman."

36. Q. If any of you have said that you have navigated the Rio Grande River in the steamer referred to in the last preceding interrogatory, state whether any of you have any personal recollection of a trip that such steamer made in the first half of the year 1873, when it took 42 days, or thereabouts, to go from Brownsville to Rio Grande City; and if so, state what caused it to take such length of time, and how long it took such boat to go back down the river from Rio Grande City to Brownsville. And, if you state that it only required a few hours or a short time to do so, please state why such steamer was enabled to go back down the river more rapidly.

A. I don't remember the voyage referred to.

37. Q. Do you remember that on the trip referred to in the last interrogatory, after said boat reached Rio Grande City a flood came down the river and furnished sufficient water to float the boat back down the stream without touching on the bars or shallows?

A. No.

230 38. Q. In describing the navigation of the Rio Grande please state whether the same was in the past ever a financial success; and if so, during what period it was financially successful, and whether during the period it was so successful the navigation of the river was aided by either the Government of the United States or the Government of the Republic of Mexico.

A. The navigation of the Rio Grande River was financially successful up to 1896. It has not been aided by either Government, except in carrying the supplies to troops.

39. Q. Please state whether or not the navigation of the Rio Grande River at the present time is successful or otherwise.

A. On account of want of water it is unsuccessful.

40. Q. Please state what the ruling price per hundred pounds and also per ton has been in the past, within your knowledge, for transportation between Brownsville and Rio Grande City when carried by boat, and what the ruling price per hundred pounds and per ton river freight now brings on the steamboat "Bessie" between such points, and state whether there is any other steamboat plying the said river at the present time besides the "Bessie."

A. Freight rates differed at different times; 1866 to 1870 freight per 100 pounds to Rio Grande City from Brownsville averaged 75 cts.; from 1870 to 1875 it was 50 cts. per 100 pounds; from 1875 to 1885 averaged about 60 cts.; from 1885 to 1894 averaged 50 cts. At present there is no fixed rate of freight. It is a matter of contract. The "Bessie" is now the only navigating boat in the river.

41. Q. In connection with the shipment of freight up and down the river Rio Grande, state whether there are any railroads which were built along the same for any distance on either the Mexican or American side, or which compete with the steamer "Bessie," and on which side of the river such railroads are built, and the termini of the same, and when the same were completed, and for what commercial purpose the same were built.

231 A. There is a narrow-gauge railroad on the Mexican side to San Miguel. It does not compete with the "Bessie."

42. Q. Please state where the goods and supplies that are shipped over any such railroad for the Rio Grande country are delivered to the road.

A. At Matamoros.

43. Q. Before this railroad was built what method was there of getting shipments of freight into Rio Grande City from distant points other than by navigation from Brownsville, and what was the cost per hundred pounds or per ton of getting such shipments by such means?

A. This railroad has not interfered with the transportation of freight into the Rio Grande City.

44. Q. Before such railroad was built were not the rates for river freight greatly in excess of the rates put into effect by such railroad and which now obtain on points along the Rio Grande River, and is not freight on goods and supplies shipped over the railroad and by boat to points along the river Rio Grande now very much less than before such railroads were built? If so, was not the reduction in such freight rates caused by the

232 construction of such railroad, and did not the construction of such railroad thereby cause the declining in the navigation of the river Rio Grande.

A. The building of the railroad did not have any effect on the navigation of the Rio Grande to points on the American side of the river.

45. Q. Could the navigation of the river from Brownsville up the stream be carried on after the construction of such railroad so as to successfully compete with the same in their freight rates between their termini and intermediate points along such river, and is not the decline of navigation on said river due to the inability of boats to compete with freight rates put in effect by such railroad?

A. No such railroad is contemplated on the American side of the river.

46. Q. Do you know the location of Comargo; and if so, how long have you known it, and was there ever any considerable amount of freight ascended such river on boats to Comargo to such point?

A. Yes; boats ceased running to Comargo twelve years ago.

47. Q. Was not Comargo a center for the supplying of interior points of Mexico, even at great distance away therefrom? If it was, at what distance? Please state what sized place Comargo is now and what size place it was prior to the building of such road; and if it is a place of less size now, please state if it is not also of less commercial importance than formerly. State, if you know, what has caused the decline of Comargo in population and commercial importance.

233 A. Comargo is a decaying Mexican town.

47b. Q. Was not this decline of Comargo due to the construction of the Mexican International Railroad, running between Laredo and the interior points of Mexico and connecting at Laredo with points in the United States? Does not such railroad now supply the interior points of Mexico, which formerly contributed to the commercial importance of Comargo, at cheaper rates of freight than could be had by navigation of the river?

A. Probably to the success of Monterey. Conditions on the Mexican side of the river long ago ceased to have any effect on its navigation by steamboat.

48. Q. If you have stated that any change has occur'ed in the commercial capacity of the Rio Grande River, and have undertaken to state the

nature of such change, please state whether such statement' made were all founded upon personal observations made by you or are partly or wholly suppositions or theories.

A. I have stated my own experience and observation.

49. Q. If you have undertaken to state that there are any changes in the navigable capacity of the Rio Grande River, please state what the effects of such changes were in the increase or decrease of the flow of the
234 river at Brownsville. How much depth, more or less, did the river take on at Brownsville, and what was the effect; how much depth was there, more or less, at intermediate points between Brownsville and Ringgold Barracks, naming each place of prominence at which the water became deeper or shallower; at what points did you observe this effect; how often during the year when such effect was worked did you observe the same; how long did such effect continue?

A. I have already given my experience in previous answers to the cause of the decreased volume of water in the Rio Grande.

50. Q. Do you know whether in the year when such effect was first observable, or within a year or so before the same was observable, there was any use commenced of any of the waters of any of the tributaries of the Rio Grande for purposes of irrigation or otherwise; if so, to what extent were such waters of such tributaries used?

A. Difficult to fix a date when first decrease was observed.

51. Q. Did you know where the San Juan River empties into the Rio Grande; does it come from the American or Mexican side; what was the amount of water contributed by the San Juan to the Rio Grande when you first knew the Rio Grande; was it a considerable stream or an insignificant one? State how wide it was, and about how deep, and about the rapidity of its current where it emptied into the Rio Grande, if you know.

A. Yes; from the Mexican side; the San Juan River always since I have known it has been an inconsiderable stream, subject to freshets.

52. Q. If you have stated that there was any change in the navigable capacity of the Rio Grande, commencing at any period named by you, state whether during the year of such change or subsequent thereto
235 the flow of said San Juan River was more or less than it has been in past years. And is the flow of such San Juan River more or less now than it was when you first became acquainted with the Rio Grande; if so, to what extent has it increased or decreased? State, if you know, the cause of such increase or decrease. Are its waters now used for irrigation at any point on its course?

A. I know of no material change in the San Juan; the freshets are probably fewer.

53. Q. Please state if, before any change which you may have referred to in the navigability of the Rio Grande took place, you were acquainted with the amount of water flowing into the Rio Grande from the Salado, the San Antonio, the San Rodriguez, the Santiago, the San Philippe, Devil's River, Goolenough, the Pecos, and the Coneho? If so, state where each of those rivers or any one thereof, with which you may be acquainted, comes into the Rio Grande, with reference to the location of Rio Grande City—that is, the number of miles above such city the mouth of such rivers are. State about what was the size of each of those

streams, the depth, width, and velocity of current at the point where the same entered into the Rio Grande. Please state which ones of said rivers were larger, and which smaller than the others; also, whether there had been any decrease, at the time of any change in the navigability of the Rio Grande occurred, in the flow of either of such streams. If so, which decreased in its flow from the time when you first knew the same up to the time when the navigable capacity of the Rio Grande underwent any change.

A. Not from personal observation.

54. Q. As a matter of fact, were you ever personally at the mouth of any of these streams? If so, please name the same, and state when and often you were there previous to such change in the navigable capacity of the Rio Grande; also, how often you have been there subsequent to such change in its navigable capacity.

236 A. Have been at mouth of Salado, but not recently.

55. Q. If, in answer to the foregoing question, you should state that there has been any decrease or increase in the amount of water flowing in any of the tributaries above named, since the time when you first knew the same, please state, if you know, what has caused such increase or decrease.

A. No.

56. Q. Do you know that the flow of such tributaries and of the Rio Grande varies any changes in accordance with the amount of rainfall which occurs from year to year over the watershed drained by such Rio Grande and its tributaries?

A. That is my opinion.

57. Q. Do you not know that for a great many years past the rainfall in the watersheds adjacent to the Rio Grande and these tributaries in that section of Texas and Mexico has decreased and is now less than it was in the years immediately preceding 1887 and 1888?

A. I don't know of my own knowledge.

58. Q. As matter of fact, has there not been a drouth in that section of country since the eighties, and has not this drouth resulted in the death of the greater portion of cattle and sheep, and even during periods necessitated the removal of portions of the population in various places along the river?

A. Drouths have been common in the Rio Grande region since its settlement, I believe.

59. Q. As matter of fact is there now one-half as much rainfall as there was in that section of country in such former years?

A. The average annual rainfall has not decreased to that extent.

60. Q. If in answer to the sixth direct interrogatory you stated that you know anything by personal observation as to the colors of the water of any stream which flows into the Rio Grande between its mouth at the Gulf of Mexico and the city of El Paso, Texas, please state how you know the same.

A. What I know of the color is from old settlers and other parties claiming to be acquainted with them.

61. Q. At what points above the head of navigation did you ever observe personally the colors of the waters of any such tributary, and how many times did you ever observe the color of such water above the head of navigation?

A. None.

238 62. Q. If in answering interrogatory number six you have stated that you knew the color of any water, did you answer from having seen the same during your navigation of the river and after such water had mingled with the waters of such stream where navigable, or did you get your idea of the color from having seen it come out of the tributary before it had entered the Rio Grande?

A. See answer to cross-interrogatory No. 60.

63. Q. Can you tell the color of the water of each of the following tributaries respectively: San Juan, Salado, San Antonio, San Rodriguez, Santiago, San Philippe, Devil's River, Pecos, and Concho? If so, please state the color of each one separately.

A. No.

64. Q. What is the difference between the color of the Pecos and of the Concho? What is the difference between the color of the Concho and of the Rio Grande before the Concho empties into it?

A. Don't know.

65. Q. If you undertake to tell the color of each one of these tributaries, state how you know the same and whether your statement is
239 derived from hearsay or from actual observation.

A. Don't state it.

66. Q. Were you ever at El Paso, Texas? If so, when and how often? Did you ever see the Rio Grande at such place? If so, what was the color of the Rio Grande at that place?

A. On'e, in 1873. Don't remember having observed color of river.

67. Q. Do you know that the color of any tributary of this stream is liable to vary and change greatly from time to time, in accordance with the droughts, the light floods, or the excessive floods, or even the particular dry arroyos through which such floods from time to time enter such tributaries?

A. No; color of water is due to territory it passes through.

68. Q. Do you know of a heavy rainfall comes upon any particularly timbered section of a watershed of one of these tributaries, making a flood in the tributary itself, that the color is liable to be very greatly different from the color of a flood in such tributary caused by an excessive rainfall in the nontimbered parts of the watershed of such tributary?

A. I do not.

240 69. Q. If you say that you knew the color of the floods of the Pecos River which empty into the Rio Grande, please state whether in recent years there has been any change in the color of the Pecos floods.

A. Don't know.

70. Q. Witness Kelly is asked whether he is the same man who made an affidavit to be used in the trial of the injunction which was granted in this case in 1896 or 1897, and whether it is true that he therein stated that he had not observed or heard remarked on the river any reference to waters which from their color appeared to come from the Upper Rio Grande itself since in the early eighties. In this connection said witness is asked to state when he last observed flood waters while on the navigable part of the Rio Grande which from its color he judged to come from the Upper Rio Grande.

A. I don't remember, and have no copy of affidavits. About the 19th of May, 1897, I judged from the color of the water that the rise was from the main stream. On the 27th of August it presented the same appearance (1897, same year).

71. Q. If it is true that witness Kelley has not observed any flood waters on the navigable portion of the Rio Grande which from their color he judged to come from the Upper Rio Grande, then is it not true, according to his observation, that the flood waters of the Rio Grande have not contributed materially to the navigation of that stream since in the early eighties?

A. My observation is that the flood waters of the Rio Grande have contributed to the navigation of the stream up to 3 or 4 years ago.

241 72. Q. For how long a period during each year, and at what time of the year, is the amount of the water in the Rio Grande, in its navigable parts, substantially increased by flood flows coming in from its tributaries?

A. At various periods of the year.

73. Q. During such period, to what extent is that navigable depth of the Rio Grande increased, and how much is such stream widened?

A. At low water the Rio Grande shrinks at Brownsville to a width of less than 200 feet. In freshets it is over 300 yards across.

74. Q. When such floods come, are the waters confined within the banks, or do such floods rise over the banks of the Rio Grande and deposit waters in lagoons, lakes, and depressions?

A. At Brownsville and many points between Brownsville and Rio Grande City a 16-foot rise will overflow the banks.

75. Q. What portion of any particular flood which may in a week or ten days pass Ringgold Barracks will reach Brownsville? Does the amount of water which will reach Brownsville from such flood, lasting say a week at the head of navigation, constantly decrease as it comes down the channel and deposit itself in such bayous and lakes, or is it absorbed by the sand?

A. A rise of 18 feet at Ringgold will give about 14 feet at Brownsville. Rises decrease by absorption and otherwise on their way down river.

76. Q. Have you any knowledge or information as to how far below El Paso water will run in the channel of the river before it is
242 absorbed and taken up by the sand, when, for five days or ten days or thirty days, at El Paso, such water ran one foot deep and fifty feet wide, or when it ran at any other particular depth or width for any given period of time at El Paso?

A. No.

77. Q. Do you know what would be the effect of a flood at El Paso, Texas, which ran a thousand cubic feet per second for one day, or ten days, or twenty days, or thirty days, so far as increasing the depth and velocity of water in the river at Fort Quitman, Presidio del Norte, or the mouth of the Pecos, or Eagle Pass, or Rio Grande City, or Brownsville is concerned?

A. I have no accurate knowledge.

78. Q. Do you know how much the river would be raised at Rio

Grande City by a flood passing El Paso, Texas, amounting to 15,000 cubic feet of water per second, and running for ten days at that rate?

A. No.

79. Q. Do you know, in the month of May, 1897, whether any flood entered the Rio Grande from either the San Juan, Salado, San Antonio, the San Rodriguez, Santiago, San Philipe, Devil's River, Pecos, or the Concho? If you , which one of the streams do you know of any flood entering the Rio Grande from during that month?

A. There was a rise in the San Juan on the 17th day of May, 1897.

80. Q. Have you any knowledge as to whether any flood came from either one of those tributaries into the Rio Grande during that month? Please state which one of them you do not know with reference to.

A. See next preceding answer.

81. Q. Do you know whether there was a flood from either one of those streams entering into the Rio Grande during the present calendar year? If so, which one of them had a flood and what month did the same occur in? If you do not know with reference to any one of the same during the present year, please state which one you do not know with reference to.

A. There was a flood in the San Juan in the early part of the fall; I don't know as to the other tributaries.

82. Q. In interrogatory seven you are asked to state your full knowledge of the effect of the ordinary flow of water and of the flood waters which come from above El Paso. As a matter of fact, have you had any personal observation which will enable you to state just what regular flow or flood flow comes from El Paso or above there, or are you simply depending upon hearsay as to that?

A. No.

83. Q. Do you know anything about the amount of waters which have flowed regularly by El Paso since 1880 or previous thereto?

A. No.

84. Q. What was the width and the depth of the water flowing in the Rio Grande passed El Paso in 1880? What was it in 1885? What was it in 1890? What was it in 1895? What was it in 1899?

244 A. I don't know.

85. Q. Do you know during what years, between those dates or previous to those dates, the river has been absolutely dry at El Paso for any considerable number of months in the year; and if so, what months?

A. Don't know.

86. Q. Do you know what flood flows passed El Paso in the years above named? Do you know how long the flood of 1897 at El Paso lasted?

A. Do not.

87. Q. If you have testified as to any flood flows passing by El Paso during any of these years, state whether you were at El Paso and saw them or whether you were simply guessing that they passed El Paso because you saw them at a point further down the river?

A. I have not testified.

88. Q. If you saw any floods down the river at any navigable part

thereof during any of these years, is it not possible that they may have come from some of the tributaries of the Rio Grande above named?

A. No doubt many of them did.

89. Q. Is it not possible that such floods may have come from heavy rains along the Rio Grande below El Paso?

245 A. Quite possible as to some of them.

90. Q. How far above El Paso where you ever? Did you ever come up the Rio Grande from the head of navigation to El Paso overland and observe the flow of the Rio Grande along its entire course?

A. Have not been above El Paso; no.

91. Q. If, in answer to interrogatory eight, you state that you have personally observed the bed of the said Rio Grande as to hollows of depressions, and that the same is porous and capable of large absorption, or that the same has sloughs or bayous and arroyos which have a natural tendency to detract from its navigable capacity during a low stage of water and which have to be filled before the river can be raised by floods and increased flows, please state what ultimately becomes of the water which is consumed by such porous character of soil or which runs into such sloughs or bayous or arroyos.

A. I believe it is largely evaporated.

92. Q. Does this water stand in such sloughs and bayous until it is absorbed by the soil or by evaporation?

A. No; many of them are used as watering places for cattle.

246 93. Q. If you state that you have observed such sloughs and bayous, state how far up the river you have observed the same, and whether practically the same condition does not continue up the stream to El Paso and north of that place.

A. I think not.

94. Q. If you state that such sloughs and bayous check and hold this waters and such waters sink into the sand and are absorbed, please state if these facts would not tend to constantly decrease any floods which might pass El Paso and so decrease the same as to practically consume it, so that it would not substantially aid navigation where said river is navigable.

A. I don't believe they have any effect upon a rise in the main stream or tributaries.

95. Q. If, in answer to interrogatory eight, you state that the flood waters of the river are necessary to fill bayous and depressions in order to keep the regular current flowing down, then please state whether, in your opinion, that result is the greatest good produced by these floods. As a matter of fact, the floods are treacherous, are they not?

A. Don't understand the question.

247 96. Q. Are you acquainted with the steamer "Bessie;" and if so, what relation towards it do any of you bear? Can the steamer "Bessie" come up the Rio Grande against the flood coming down the stream with any considerable force?

A. I am owner of the "Bessie." Yes; she is a full-powers boat for her tonnage, which is 100 tons.

97. Q. It is a fact, is it not, that it is exceedingly trying any dangerous to the safety of the vessel and the progress of the same to undertake to navigate the river, depending upon the flood flow?

A. Question unintelligible to me.

98. Q. It is true, is it not, that if the steamer comes up the Rio Grande during a flood it is exceedingly liable to be stranded by reason of the subsidence of the flood before the steamer reaches its destination?

A. No.

99. Q. Can the steamer "Bessie" come up the Rio Grande at all during the heaviest flood flows which occur along its navigable course? Is it not true that she can better navigate when the floods are not greatest, and that if the excessive floods were lessened she would make quicker and safer trips?

A. Boat never attempts to go upstream at the height of a freshet. The judgment of the captain determines when she shall go up.

248 100. Q. How many irrigating ditches do you know of from the vicinity of El Paso to Brownsville, Texas? If any, where are the same located and how much of the Rio Grande do they divert and on which side of the river are they, on the American or Mexican side?

A. Don't know of any.

101. Q. In direct interrogatory tenth you are asked what would be the effect of storing water 125 miles above El Paso, Texas, so far as the navigability of said river is concerned. Do you know a point named as Elephant Butte, about 125 miles above El Paso, Texas? Were you ever at such point? Do you know whether the bed of the proposed reservoir at Elephant Butte is sandy, or whether the river at that point flows through a rocky cañon? When were you there?

A. I doubt. I was never there.

102. Q. Do you know the character of the bed of such stream below Elephant Butte down to a point of rocks just above Las Cruces, New Mexico? What is the character of the bed of such stream at such point?

A. I do not.

103. Q. Have you ever been connected with an irrigation company or had any experience in the use of waters of reservoirs? If so, where, and what experience have you had? How large was the reservoir with which you had such experience?

A. No.

249 104. Q. Do you know what per cent of the waters which would be impounded by a dam thrown across the river 125 miles above El Paso, Texas, would pass off by evaporation?

A. No.

105. Q. Suppose such dam held water fifty feet deep, ten miles long, and a mile wide; what amount, in depth, of such water, in such place, would pass off by evaporation; and how do you know that?

A. I don't know.

106. Q. Do you know how much such water, when being let out of such dam, and used in the neighborhood thereof for irrigation without being taken out of the valley of the Rio Grande, would return to the Rio Grande and contribute to its flow? If so, what per cent would so return? What would become of the balance of the water? What part would pass off in vegetation? What per cent of what is lost would be due to absorption?

A. I do not.

107. Q. What would be the effect upon the flow of the river at its navigable parts, if the water of the stream so impounded at this point, 125 miles above El Paso, and used, as is asked in direct interrogatory tenth, for manufacturing purposes, and let back into the river in such quantities as would be sufficient to supply all ordinary manufacturing purposes which might be located thereunder?

A. Question not intelligible to me.

250 108. Q. As matter of fact, have you sufficient technical knowledge to be certain what the effect of impounding the waters of the Rio Grande 125 miles above El Paso, and using them along the banks of the stream for irrigation, would have upon the flow? Do you not know it to be a fact that such acts would tend to equalize the average flow of such river?

A. I have already answered as to my knowledge of this subject; I do not.

109. Q. If 500 cubic feet of water per second were taken out of a reservoir constructed 125 miles above El Paso, how much of it would reach El Paso and how much of it would be lost in the bed of the river itself by absorption and evaporation?

A. I don't know.

110. Q. If five hundred feet of water reached El Paso, Texas, traveling down the bed of the stream, after having been turned out of the reservoir 125 miles above El Paso, how much of it would be diverted out of the stream by the Juarez dam at El Paso and flow off down the Juarez Canal on the Mexican side, and how much of it would be diverted by the El Paso wing dam and flow down to El Paso?

A. I don't know.

111. Q. If you have stated that the flood of waters of the Upper Rio Grande ever reached the lower portion of the river, please state at what season of the year the floods usually come down the river.

A. Spring and fall, usually.

251 112. Q. If any of the floods waters from El Paso or above ever come down the Rio Grande, and you have undertaken to state that there are any sloughs, bayous, or arroyos in the bed of the stream which such flood waters might fill up, or that such flood waters do actually fill up the same, please state when the flood waters fill the same, and how long the waters remain therein. State if it is not a fact that even if enough flood waters come down to fill the sloughs, bayous, and depressions in the bed of the Rio Grande, that such flood waters would and do evaporate or disappear before the perennial flow of the Rio Grande comes down the same.

A. I have already given my opinion on this subject in previous answers.

113. Q. Have not the floods of the Rio Grande at Presidio, Rio Grande City, Laredo, Eagle Pass, and Brownsville been greater during the present year than they have been for many years previous? If you answer that they have not, please state during what years, within the past ten years, and during what month in such years, there have been heavier floods than during the present year. In your answer, name each year during the last ten years, and the month or months of each year during which the floods have been greater than they have during the present

year at the points mentioned. And state, if you know, *that* the highest water reached by the river at each of such points during the present year, and the time of such high water, and the highest water at each of said points during the past ten years.

A. The floods have been greater this year at Brownsville than for many years previous, as to high water, but not as to period for which flood continued. No accurate record is kept of the highest water at Brownsville or Rio Grande City. I don't know about other points.

252 114. Q. With whom have you conversed about giving testimony in this case? Were you asked to come in person at the trial of this case, and give your personal evidence, by any one; and if so, whom? When did you first see, or have read to you, the interrogatories and cross-interrogatories which have been propounded to you, and who first showed them to you and told you of the same?

A. Warner P. Sutton asked me to go in person to the trial of this cause; when I came into this room the direct and cross-interrogatories were shown to me by Chas. F. Tilghman, U. S. commissioner, who had served written notice upon me December 1st, 1899.

115. Q. Have you read over such interrogatories or cross-interrogatories with any one previous to having the same propounded to you by the officer taking your deposition? If so, with whom did you read over the same?

A. No.

116. Q. Has any one written out for you or furnished you with a written answer or suggestion—a written answer which would be suitable to any of the interrogatories or cross-interrogatories which have been submitted to you? If so, who has done so?

A. No.

117. Q. Has any one suggested any portion of the answers or any portion of an answer to these interrogatories? If so, whom?

A. No.

253 118. Q. Do you speak English, or have the questions been translated to you? If so, have your replies thereto been translated into English before being written down?

A. Yes.

119. Q. In whose presence, and where, and on what day have you given this answers? Name every one who has been present while you were giving this testimony, listening to the same. Has any attorney been present; if so, give his name and state whether he was the attorney for plaintiff or for the defendant?

A. Before Chas. F. Tilghman, U. S. commissioner, in United States court room, on the 2nd day of December, 1899; no person except commissioner and myself.

120. Q. Has any one representing the United States Government or pretending to so represent it been present at the taking of this testimony? If so, state his name.

A. No.

(Signed) WILLIAM KEELY.

And at this the hour of 4.30 p. m. of this the 12th day of December, 1899, an adjournment of the hearing and trial of this cause is taken to-morrow morning at 9 o'clock a. m., the same being December 13th, 1899.

254 And now at this hour of 9.30 a. m. of this the 13th day of December, 1899, pursuant to the adjournment, the further hearing and trial of this cause is resumed.

Present as before.

JESSIE SUMPTER, a witness on behalf of the United States, the plaintiff, living at Eagle Pass, Maverick County, in the State of Texas, having previously given his testimony by deposition, taken on direct and cross-interrogatories, the said deposition was then read in evidence as follows:

Interrogatory 1. Q. What is your name, age, residence, and occupation?

A. My name is Jesse Sumpter; my age is 72; my residence is Eagle Pass, Texas; my occupation is inspector of U. S. customs.

Interrogatory 2. Q. When did you first see the Rio Grande? How long have you had personal observation of it, and over what part of it has your personal observation extended? State fully.

A. I first saw the Rio Grande in 1849; from 1849 until the present time; principally in the vicinity of Eagle Pass. My observation has also extended as far above as El Paso, and below as far as Rio Grande City.

Interrogatory 3. Q. State what you know, if anything, by personal experience if you had any as well as by personal observation, of the navigation of said river—the character of such navigation, the amount and extent thereof, and the time when such experience and observation began and ceased?

A. I saw the wreck of a steamer in 1864 which was said to have come up as far as Laredo. I have no personal knowledge of the navigation of the Rio Grande.

255 Interrogatory 4. Q. State what you know, from personal observation and experience or either, concerning the navigable capacity of said river when you first knew the same, mentioning that part of its course which had a navigable capacity, and what portions of the year it was navigable, naming the months or parts of months, according to your best recollection.

A. Concerning the navigable capacity of said river I know nothing.

Interrogatory 5. Q. State, from your personal observation or experience, or both, whether since your first knowledge, if you have any, any change has occurred in the navigable capacity of the said river, and as nearly as you can the year when such change became observable, the nature of such change, if any, its extent, and any circumstances which from time to time occurred to impress such change upon your mind.

A. I have no knowledge nor never had of the navigable capacity of said river, but know that the volume of water is much less than when I first became acquainted with the Rio Grande. The first diminution I noticed in the volume of water was about the year 1882, to the best of my recollection.

Interrogatory 6. Q. State what, if anything, you know by personal observation of the character of the stream which flow into the Rio Grande between its mouth at the Gulf of Mexico and the city of El Paso, Texas; as to the color of the waters of the same, if they have any peculiar colors; the extent of the waters they contribute to the Rio Grande; the time of

the year when each is accustomed to furnish the greatest volume, and any other facts or circumstances within your personal knowledge affecting the navigable capacity of the river.

A. Of the streams which flow into the Rio Grande between its mouth at the Gulf of Mexico and El Paso, the Pecos is the largest that I know of, with the exception of a river which flows into the Rio Grande from the Mexican, the name of which I have forgotten. I know
256 nothing of the colors with the exception of the Pecos which is of a reddish color. I have no knowledge of streams running into the Rio Grande from the Mexican side above Eagle Pass, if any, as I have never travelled on the other side of the river. I know nothing of the extent of the waters contributed by the tributaries of the Rio Grande, nor do I know the time of the year in which each is accustomed to furnish its volume of water.

Interrogatory 7. Q. State what, if anything, you know of the color, nature, and extent of the waters of the Rio Grande at and above El Paso, Texas; and in this connection state what you know, or have known from year to year, since your knowledge began, of the effect of the flood waters, or so-called torrential flow, as to the time of the year when the same became manifest in navigation, and also state the same of the ordinary flow of waters, or so-called perennial flow—all of this as far as your knowledge will permit, as to waters coming from and above El Paso.

A. I know nothing of the waters above El Paso; I know nothing of the effect of the flood waters from and above El Paso.

Interrogatory 8. Q. State what you know, from personal observation, of the character of bed of the said stream as to hollows or depressions, as to whether the same or any part is porous and capable of rapid absorption of water, as to sloughs or bayous and arroyos, so called, or any other features outside of evaporation, which would have a tendency to detract from the navigable capacity during a low state of water, and require to be filled before water coming down stream could be useful in tending to raise the river to a navigable height.

A. I know of hollows and depressions in the river, but what effect they have upon the navigable capacity and absorption of the river, I know nothing. I do not know what effect slews, bayous, and arroyos have upon the navigable capacity of the river.

Interrogatory 9. State whether, within your knowledge of the river, there have been any changes in cutting timber along the stream,
257 or of any other nature than the diversion of the water for mining and irrigation purposes, tending to impair or reduce the navigability of the stream in that part of the same where it was navigable when you first knew it.

A. To the best of my knowledge there has never been any timber cut on the Rio Grande; and to the best of my knowledge there has never been any to cut.

Interrogatory 10. Q. State whether, from your experience and knowledge of the said river, the construction of a dam and the storage or impounding of any considerable quantity of water and the diversion of the same for manufacturing purposes at a point across the same about 125 miles above El Paso, Texas, in the Territory of New Mexico, would have any influence upon the navigability of said river where it is now

navigable; and if any, what that influence would be. Of this state fully, giving reasons.

A. I believe the construction of a dam and the storage of a considerable quantity of water would affect the navigability of the river.

Interrogatory under Rule XXXIX. Q. Do you know or can you set forth any other matter or thing which may be of benefit or advantage to the parties at issue in this cause, or either of them, or that may be material to the subject of this your examination or the matters in question in this cause? If yes, set forth the same fully and at large in your answer.

A. I believe that if the waters of the Rio Grande are not diverted above El Paso, the river, with a little cost, could be made navigable up to Eagle Pass, and above.

258 And the cross-interrogatories propounded to the said witness at the time of the taking of the said deposition aforesaid, and his answers to the same, were thereupon read in evidence as follows—that is to say:

1. Q. How long have you resided at the place of residence named by you, and how long have you been engaged in the business named by you in your direct examination? Where and what place have you resided other than at the places so named by you, and from what time to what time at each of such places, and what other occupations have you been engaged in, and from what time to what time have you been so engaged in the same?

A. I have lived at the place of residence named by me for fifty years, with the exception of one year, 1876, when I lived in Uvalde. I have been engaged in the business named by me in direct interrogatory for five years and one-half. I have resided at no place except Eagle Pass and Uvalde. In 1853-4 I was deputy sheriff of Bexar County, Texas. Eagle Pass at that time was in precinct No. 15 of Bexar County. I was in the stock business from 1852 until 1867. I was inspector of customs for the Confederate Government from 1862 until 1865. I was first sheriff of Maverick County when it was organized, in 1872, and continued until June, 1876; after that I was in different kinds of business until my appointment as inspector of customs in May, 1894, which position I now hold.

2. Q. Are either of you now, or have you been, in the employ of the United States, in any capacity, or have you worked for or been in the employ of the International Boundary Commission between Mexico and the United States; and if so, in what capacity?

A. I have been a soldier in the United States Army. I have never been in the employ of the International Boundary Commission in any capacity.

3. Q. If in answer to direct interrogatory number two you undertake to state how long you have had personal observation of the Rio Grande and over what part of it your personal observation has extended, please state how much of this river you have ever been over, and give the highest point on it you were ever on in person and how often
259 you have been to such point in person.

A. My observations have extended from Eagle Pass down the river to Rio Grande City. In 1864 I took a raft loaded with cotton

from Laredo to Rio Grande City, at which time I was inspector of customs for the Confederate Government, but had a leave of absence for one month. El Paso is the highest point on the river I have ever been to in person. I have been there on two occasions—1849 and 1850.

4. Q. If you have stated that you have been on the Rio Grande and given the highest point at which you have been, please state whether you have traveled over the intermediate points between such highest point and Brownsville, Texas, in person; and if so, please state what intermediate points you have traveled over, and how often you have been over such intermediate points or any particular one of the same, describing such point.

A. Upon my trips to El Paso I have touched the river at intervals—about once. I have no knowledge of the intermediate points between Eagle Pass and Rio Grande City, as I went from Laredo to Rio Grande City, once in 1864, in boats.

5. Q. If you have stated that you have had personal observation of any portion of the Rio Grande, please give the length in miles, measuring by the course of the river, that you have had personal observation over, and the length of the same measured in a direct line between the highest point and the lowest point which has been covered by your observation.

A. I have no knowledge of the number of miles between Laredo and Rio Grande City by the course of the river. The distance direct from Rio Grande City to Laredo is something over 100 miles.

6. Q. If you have stated that you have had personal observation of any portion of said river, please name the tributaries which said river has on that portion of it covered by your observation, and also
260 please state the distance from tributary to tributary, coming up the river, and whether such tributaries come in on the American or Mexican side of the river.

A. The tributaries of which I have recollection were two above Camargo, the names of which I do not now remember, said streams being on the Mexican side. The Rio Grande has no tributaries of any consequence on the American side of the river between the points mentioned.

7. Q. If you have named any tributaries which come into the Rio Grande, or have stated that you know of any tributaries that come into the same, please state all the facts which you know with reference to such tributaries, and state where they rise, how long they flow, whether the valleys of such tributaries are settled or unsettled, whether the waters of such tributaries are used for irrigation or mining purposes, how such tributaries are used for irrigation or mining purposes, how much land is cultivated on each tributary, and whether the waters of such tributary are used for irrigation or mining purposes.

A. I have no knowledge as to the rising point, the length of them, or whether they are used for irrigation or mining purposes.

8. Q. If you have stated that any of the waters of the tributaries of the Rio Grande are used for irrigation or mining purposes, please state how much of the same, and how long they have been so used, and state how much land is cultivated on each tributary by means of the water of the same, and what portion of the waters of such tributaries are used for irrigation or mining purposes.

A. I know nothing of the information asked for in the 8th cross-interrogatory.

261 9. Q. If you have stated that any part of the water of such tributaries so flowing into the Rio Grande is used for irrigation or mining purposes, please state at what point on the same the waters are diverted from the streams for such purposes, and whether more or less water is now used on each of such tributaries, naming them, than was formerly used; and if so, when the increase or decrease in such use commenced, and when it reached its maximum.

A. As I have not stated that I knew the waters of the Rio Grande were used for mining or irrigation purposes I have no knowledge of the matters inquired about in cross-inty. 9th.

10. Q. If you have stated that you know any of the tributaries of the Rio Grande, please state whether any dams or reservoirs are on any such streams, naming them, and if there are, where the same are situated, and in or across what streams they are constructed, and when they were constructed, and whether any of the same were constructed by authority of the Mexican Government or by permission, if you know.

A. I know nothing of the matters inquired about in cross-interrogatory 10.

11. Q. If you have stated that you are acquainted with any of such tributaries of the Rio Grande, please state whether the flow of the same was or is constant, or whether the same is spasmodic or intermittent, describing in detail, in this respect, each particular tributary; and also state whether such streams are known as flood streams or perennial streams, and at what seasons of the year their floods generally come; if they are flood streams, or if large floods come down the same, and how long such floods last, and what becomes of such floods.

A. I have no knowledge of the matters inquired about in cross-interrogatory 11th.

12. Q. If you have stated anything with reference to the navigation of the Rio Grande, please state the highest point on such river to which permanent navigation has ever extended.

A. I know nothing of the permanent navigation of the Rio Grande, except from hearsay.

13. Q. If you have stated that you know anything with reference to the navigation of the Rio Grande, please state how many boats were ever used and employed in such permanent navigation and how many are now used in the same, and what was the size and capacity of each of said boat or boats, and how much water each thereof drew, and how often such boats ascended or descended such river during each year, and during what months during the year they made their ascents and descents.

A. I know nothing of the matters inquired about in the 13th interrogatory.

263 14. Q. If you have stated anything about any boats that navigated the Rio Grande at any time, please state whether such boats made their trips on such river on schedule time, and whether there were particular days of departure, which were adhered to, or whether the trips were only occasional, intermittent, and without knowledge on the part of the public or boatmen as to when the boats would arrive at or depart from terminal or intermediate points at which they touched.

A. I know nothing of the matters inquired about in cross-interrogatory No. 14.

15. Q. If you have stated that there ever was any navigation on the Rio Grande, or is any navigation on it now, please state to what extent the points and people along said river depended upon such navigation for commercial purposes in the past, and to what extent they depend on the same at present, and as to whether they did in the past or do now depend mostly on such navigation, or do they depend mostly upon freighting to and from railroads and commercial centers.

A. I do not know whether the people depend upon navigation for commercial purposes or upon freighting.

16. Q. Please state how long, in recent years, it would usually take a boat to ascend the Rio Grande from Brownsville, Texas, to Rio Grande City, and give the distance between Brownsville and Rio Grande City when measured by the course of the river, and also the distance between said points along the usual traveled wagon road between the same.

A. I neither know the time it would take a boat to go between the two points named, nor do I know the distance between such points.

264 17. Q. Have you not personally observed hulls or wrecks of old boats inside the bar at the mouth of the Rio Grande and up the course thereof and some distance therefrom?

A. I saw the wreck of a boat on the rocks between Laredo and Rio Grande City.

18. Q. If you have said you observed any hulls or wrecks of old boats, as interrogated about, please state how these boats got there and how far up the river their wrecks were observed by you; and state, if you know, how they came to be wrecked and when they were wrecked.

A. I have no knowledge of the cause of the wreck. I observed the wreck, to the best of my recollection, about half way between Laredo and Rio Grande City.

19. Q. As matter of fact, is it not true that such boats got into the river over the bar at the mouth thereof? And is it not a fact that many of them were cut in two in order to get them over the bar, and were afterwards abandoned by the parties undertaking to use them? And if "yes," state how long ago this occurred and the reason, if you know, why the boats were so abandoned.

A. I know nothing of the matters inquired about.

20. Q. If you have stated that you know anything of the character of such navigation, state whether or not vessels can come in from the Gulf of Mexico to the mouth of the Rio Grande at the present time, and how far up the river they can come from such Gulf. If you say they
265 can not come into the mouth of such river, or up the same, please state what prevents them from so doing.

A. I know nothing of the matters inquired about from my own knowledge.

21. Q. Is there not an obstruction at the mouth of the river Rio Grande which prevents boats from going into the same from the Gulf of Mexico; and if so, what is such obstruction?

A. I know nothing of the matters inquired about.

22. Q. Do you know how much fall there is in the course of the river from Ringgold Barracks to the Gulf of Mexico per mile?

A. I know nothing of the matters inquired about.

23. Q. What is the character of the current of the river Rio Grande immediately above its entrance into the Gulf of Mexico?

A. I know nothing of the matters inquired about.

24. Q. Has the Rio Grande, for several miles from the mouth of the same, any appreciable current?

A. I know nothing of the matters inquired about.

25. Q. How far up the course of the river Rio Grande do the tides of the Gulf of Mexico affect the depth of the water in the river, and at

what season of the year are these tides heaviest, and when at their

266 heaviest how far up the river do they affect the current of the same?

A. I know nothing of the matters inquired about.

26. Q. In describing the character of the navigation which you testified with reference to, please state what the average depth of the water near Brownsville is during the period when it is usually deepest, and how far up the river the depth continues the same.

A. I know nothing of the matters inquired about.

27. Q. At what period of the year is the depth of the river Rio Grande at Brownsville the greatest, and at what period is it the shallowest, and for how long does the depth continue at its maximum and how long does it continue at its minimum?

A. I know nothing of the matters inquired about.

28. Q. How shallow does the water get in the river at Brownsville?

A. I know nothing of the matter inquired of.

29. Q. What character of bed has the river Rio Grande, and is the bed of the same permanent or is it shifting; is it rocky or is it sandy; are there any shallows in it or any sand banks in it?

A. In places it is sandy, in places it is shallow, and in places it is deep. The bed of the river is shifting in places; in places it is also rocky. There are shallows and sand banks, both, in the river.

267 30. Q. If you have stated that there are either shallows or sand banks in the bed of the Rio Grande River, please state whether the same are below Rio Grande City, and if they are—if they are sufficient to in any way impede the navigation of the river; and if they are, for how long do they impede navigation.

A. My knowledge of the river below Rio Grande City is not sufficient for me to answer the 30th cross-interrogatory.

31. Q. If you have stated what the condition of the bed or depth of the Rio Grande River is, please state how long such conditions have maintained within your knowledge.

A. I do not know how long these conditions have maintained, as I have not been sufficiently interested to pay any attention to the river's condition.

32. Q. Was there ever, at any time within your knowledge, any great permanency to the channel of the Rio Grande River, so far as depth and course are concerned, or was the depth and course of the same constantly changing?

A. The depth and channel of the same has been changing in certain

parts of the river. There has never been any great permanency in the channel of the Rio Grande in certain places.

33. Q. What effect, so far as changing the banks and the bed of the Rio Grande, would the heavy floods which came down the river have?

A. The floods which take place frequently change the channel of the river from one side of the river to the other.

34. Q. How often during a trip up or down the river did the boat or boats which navigated the same ground upon these sand bars or shallows?

268 A. Know nothing of the matters inquired about.

35. Q. Did any one of you ever navigate the river Rio Grande on the steamer known as the "San Roman," or a steamer bearing that character of name. If so, was that the correct name of such steamer? And if not, please give its correct name.

A. I have never navigated on the steamer mentioned, and do not know the correct name thereof.

36. Q. If any of you have said that you have navigated the Rio Grande River in the steamer referred to in the last preceding interrogatory, state whether any of you have any personal recollection of a trip that such steamer made in the first half of the year 1873, when it took 42 days or thereabouts to go from Brownsville to Rio Grande City; and if so, state what caused it to take such length of time, and how long it took such boat to go back down the river from Rio Grande City to Brownsville. And if you state that it only required a few hours or a short time to do so, please state why such steamer was enabled to go back down the river more rapidly.

A. I know nothing of the matters inquired about.

37. Q. Do you remember that on the trip referred to in the last interrogatory after said boat reached Rio Grande City, a flood came down the river and furnished sufficient water to float the boat back down the stream without touching on the bars or shallows?

A. I know nothing of the matters inquired about.

269 38. Q. In describing the navigation of the Rio Grande, please state whether the same was in the past ever a financial success; and if so, during what period it was financially successful and whether during the period it was so successful the navigation of the river was aided by either the Government of the United States or the Government of the Republic of Mexico.

A. I have no knowledge of the queries contain' in this interrogatory.

39. Q. Please state whether or not the navigation of the Rio Grande River at the present time is successful or otherwise.

A. I do not know whether or not the navigation of the Rio Grande is successful.

40. Q. Please state what the ruling price per hundred pounds and also per ton has been in the past, within your knowledge, for transportation between Brownsville and Rio Grande City, when carried by boat, and what the ruling price per hundred pounds and per ton, river freight, now brings on the steamboat "Bessie," between such points, and state whether there is any other steamboat plying the said river at the present time besides the "Bessie."

A. I know nothing of the matters inquired about.

41. Q. In connection with the shipment of freight up and down the river Rio Grande, state whether there are any railroads which were built along the same for any distance, on either the Mexican or American side or which compete with the steamer "Bessie," and on which side of the river such railroads are built, and the termini of the same, and when the same were completed, and for what commercial purpose the same were built.

A. I have no knowledge of any railroads having been built on either side of the Rio Grande, either in past or present.

42. Q. Please state where the goods and supplies that are shipped over any such railroad for the Rio Grande country are delivered to the road.

A. I know nothing of the matters asked about.

43. Q. Before this railroad was built, what method was there of getting shipments of freight into Rio Grande City from distant points other than by navigation from Brownsville, and what was the cost per hundred pounds or per ton of getting such shipments by such means.

A. I know nothing of any railroads being built; I have no knowledge of the methods in which shipments were made.

44. Q. Before such railroad was built, were not the rates for river freight greatly in excess of the rates put into effect by such railroad, and which now obtain on points along the Rio Grande River, and is not freight on goods and supplies shipped over the railroad and by boat to points along the river Rio Grande now very much less than before such railroads were built? If so, was not the reduction in such freight rates caused by the construction of such railroad, and did not the construction of such railroad thereby cause the declining in the navigation of the river Rio Grande?

A. I know nothing of the matters inquired about.

45. Q. Could the navigation of the river from Brownsville, up the stream, be carried on after the construction of such railroad so as to successfully compete with the same in their freight rates between their termini and intermediate points along such river, and is not the decline of navigation on said river due to the inability of boats to compete with freight rates put in effect by such railroad?

A. I know nothing of the matters inquired about.

46. Q. Do you know the location of Comargo; and if so, how long have you known it, and was there ever any considerable amount of freight ascended such river on boats to Comargo, to such point?

A. I have known the location of Comargo ever since 1864, but knew nothing of the amount of freight which ascends the river to Comargo, and know nothing of the amount of freight which ever ascended the river to Comargo.

47-a-Q. Was not Comargo a center for the supplying of interior points of Mexico, even at great distance away therefrom? If it was, at what distance? Please state what sized place Comargo is now, and what size place it was prior to the building of such road, and if it is a place of less size now. Please state if it is not also of less commercial importance than formerly. State, if you know, what has caused the decline of Comargo, in population and commercial importance.

A. I know nothing of the matters inquired about.

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47-b- Q. Was not this decline of Comargo due to the construction of the Mexican International Railroad, running between Laredo and the interior points of Mexico, and connecting at Laredo with points in the United States? Does not such railroad now supply the interior points of Mexico, which formerly contributed to the commercial importance of Comargo, at cheaper rates of freight than could be had by navigation of the river?

A. I know nothing of the matters inquired about.

48. Q. If you have stated that any change has occurred in the commercial capacity of the Rio Grande River, and have undertaken to state the nature of such change, please state whether such statements made were all founded upon personal observations made by you, or are partly or wholly suppositions or theories?

A. As I have not stated that there were any changes, I know nothing of the queries made in this cross-interrogatory.

49. Q. If you have undertaken to state that there are any changes in the navigable capacity of the Rio Grande River, please state what the effects of such changes were in the increase or decrease of the flow of the river at Brownsville. How much depth, more or less, did

273 the river take on at Brownsville, and what was the effect? How much depth was there, more or less, at intermediate points between Brownsville and Ringgold Barracks, naming each place of prominence at which the water became deeper or shallower? At what points did you observe this effect? How often during the year, when such effect was worked, did you observe the same? How long did such effect continue?

A. As I have not made any statement in regard to any changes, I know nothing of the matters inquired about.

50. Q. Do you know whether in the year when such effect was first observable, or within a year or so before the same was observable, there was any use commenced of any of the waters of any of the tributaries of the Rio Grande for purposes of irrigation or otherwise? If so, to what extent were such waters of such tributaries used.

A. I know nothing of the queries contained in the 50th cross-interrogatory.

51. Q. Did you know where the San Juan River empties into the Rio Grande? Does it come from the American or Mexican side? What was the amount of water contributed by the San Juan to the Rio Grande when you first knew the Rio Grande? Was it a considerable stream or an insignificant one? State how wide it was, and about how deep, and about the rapidity of its current where it emptied into the Rio Grande, if you know.

A. I think the San Juan River empties into the Rio Grande above or near Camargo; it comes from the Mexican side. I know nothing of the amount of water contributed by the San Juan to the Rio Grande; I do not know how deep or wide the river was; I know that it was a considerable stream and apparently possessed no current at the place I observed it.

52. Q. If you have stated that there was any change in the navigable capacity of the Rio Grande, commencing at any period named by you, state whether during the year of such change or subsequent thereto

274 the flow of said San Juan River was more or less than it has been in past years. And is the flow of such San Juan River more or

less now than it was when you first became acquainted with the Rio Grande. If so, to what extent has it increased or decreased? State, if you know, the cause of such increase or decrease. Are its waters now used for irrigation at any point on its course?

A. I know nothing of the queries contained in this cross-interrogatory.

53. Q. Please state if before any change which you may have referred to in the navigability of the Rio Grande took place you were acquainted with the amount of water flowing into the Rio Grande from the Salado, the San Antonio, the San Rodriguez, the Santiago, the San Philippe, Devil's River, Goodenough, the Pecos, and the Concho? If so, state where each of these rivers or any one thereof with which you may be acquainted comes into the Rio Grande, with reference to the location of Rio Grande City; that is, the number of miles above such city the mouth of such rivers are. State about what was the size of each of those streams, the depth, width, and velocity of current at the point where the same entered into the Rio Grande. Please state which ones of said rivers were larger and which smaller than the others; also, whether there had been any decrease at the time of any change in the navigability of the Rio Grande occurred in the flow of either of such streams. If so, which decreased in its flow from the time when you first knew the same up to the time when the navigable capacity of the Rio Grande underwent any change?

A. As I have stated nothing regarding the change of the navigability of the Rio Grande, I know nothing of the queries in this interrogatory contained.

54. Q. As a matter of fact, were you ever personally at the mouth of any of these streams? If so, please name the same and state when and often you were there previous to such change in the navigable capacity of the Rio Grande; also, how often you have been there subsequent to such change in its navigable capacity?

275 A. As I know nothing regarding the change in the navigability of the Rio Grande, I know nothing of the matters inquired about.

55. Q. If in answer to the foregoing question you should state that there has been any decrease or increase in the amount of water flowing in any of the tributaries above named since the time when you first knew the same, please state, if you know, what has caused such increase or decrease.

A. As I have not stated that there was any increase or decrease in this stream, I know nothing of the inquiries made.

56. Q. Do you know that the flow of such tributaries and of the Rio Grande varies, any changes in accordance with the amount of rainfall which occurs from year to year over the water shed drained by such Rio Grande and its tributaries?

A. I know that the flow of water in the Rio Grande is effected by rainfall, as is also its tributaries.

57. Q. Do you not know that for a great many years past the rainfall in the watersheds adjacent to the Rio Grande and these tributaries in that section of Texas and Mexico has decreased and is now less than it was in the years immediately preceeding 1887 and 1888?

A. I do not know whether the amount of rainfall in the watersheds or adjacent to the Rio Grande and this tributaries in that section of Texas and Mexico is less than in the years preceeding 1887 or 1888.

58. Q. As matter of fact has there not been a drouth in that section of the country since in the eighties, and has not this drouth resulted in the death of the greater portion of cattle and sheep, and even during periods necessitated the removal of portions of the population in various places along the river?

A. There have been drouths in this section of the country during the eighties which have caused the death of a great many cattle and sheep, but I know of no families removing by reason of the drouth.

59. Q. As matter of fact, is there now one-half as much rainfall as there was in that section of country in such former years?

A. I think there is more than one-half the amount of rainfall now than there was at the times mentioned.

60. Q. If in answer to the sixth direct interrogatory you state that you know anything by personal observation as to the colors of the water of any stream which flows into the Rio Grande between its mouth at the Gulf of Mexico and the city of El Paso, Texas, please state how you know the same.

A. From my personal observation and an acquaintance with both the Pecos and Rio Grande rivers.

61. Q. At what points above the head of navigation did you ever observe personally the colors of the waters of any such tributary, and how many times did you ever observe the color of such water above the head of navigation?

A. I have observed the colors of the waters of all the tributaries on the American side from Laredo to El Paso at the points where the public roads cross such tributaries. I have observed the color of the waters several times, but do not remember just how many.

62. Q. If in answering interrogatory number six you have stated that you knew the color of any water, did you answer from having seen the same during your navigation of the river and after such water had mingled with the waters of such stream where navigable, or did you get your idea of the color from having seen it come out of the tributary before it had entered the Rio Grande?

A. I have never navigated the Rio Grande except to cross it, except when I went in a boat from Laredo to Rio Grande City. I have been on the banks of the Rio Grande at many places between Laredo and El Paso, and have noticed the colors of the waters at points where I have navigated it—crossed—and have been on the banks of the river. I have also seen the colors of the waters of the tributaries before they entered into the Rio Grande.

63. Q. Can you tell the color of the water of each of the following tributaries, respectively: San Juan, Salado, San Antonio, San Rodriguez, Santiago, San Philip, Devil's River, Pecos, and Concho? If so, please state the color of each one separately.

A. I can state the colors of the following rivers: Pecos River, red'ish color; San Felipe and Devil's River are clear, except when there is a freshet, when they are of a whiter color; but know nothing of the colors of the remaining named.

64. Q. What is the difference between the color of the Pecos and of the Concho? What is the difference between the color of the Concho and of the Rio Grande before the Concho empties into it?

A. I have stated the color of the Pecos River is red. I know nothing of the color of the Conecho. I have never seen the latter river.

65. Q. If you undertake to tell the color of each one of these tributaries, state how you know the same and whether your statement
278 is derived from hearsay or from actual observation.

A. The colors I have mentioned have been derived from actual observation.

66. Q. Were you ever at El Paso, Texas? If so, when and how often? Did you ever see the Rio Grande at such place? If so, what was the color of the Rio Grande at that place?

A. I have been at El Paso, Texas, twice; once in 1849 and once in 1850. I have seen the Rio Grande at El Paso and crossed it at that point. The color of the Rio Grande at that place was of a clear nature at the time I saw it.

67. Q. Do you know that the color of any tributary of this stream is liable to vary and change greatly from time to time in accordance with the droughts, the light floods or the excessive floods, or even the particular dry arroyos through which such floods from time to time enter such tributaries?

A. The change of the color in waters of these tributaries have been caused by the soil through which they run. The drouths do not change the color of the waters of these tributaries that I know of. Whenever a freshet occurs a change takes place in the color of the water.

68. Q. Do you know if a heavy rainfall comes upon any particularly timbered section of a watershed of one of these tributaries, making a flood in the tributary itself, that the color is liable to be very greatly different from the color of a flood in such tributary caused by an excessive rainfall in the nontimbered parts of the watershed of such tributary?

A. I have never noticed any such change as to whether or not there is a difference by reason of the rainfall being in the timbered or
279 nontimbered regions.

69. Q. If you say that you knew the color of the floods of the Pecos River which empty into the Rio Grande, please state whether in recent years there has been any change in the color of the Pecos floods.

A. There has been no change to my knowledge within the recent years in the color of the Pecos floods.

70. Q. Witness Kelly is asked whether he is the same man who made an affidavit to be used in the trial of the injunction which was granted in this case, in 1896 or 1897, and whether it is true that he therein stated that he had not observed or heard remarked on the river any reference to waters which, from their color, appeared to come from the Upper Rio Grande itself since in the early eighties. In this connection said witness is asked to state when he last observed flood waters while on the navigable part of the Rio Grande, which from its color he judged to come from the Upper Rio Grande?

A. As this interrogatory is not propounded to me, I have no answer to make thereto.

71. Q. If it is true that witness Kelley has not observed any flood waters on the navigable portion of the Rio Grande, which from their color he judged to come from the Upper Rio Grande, then is it not true,

according to his observation, that the flood waters of the Rio Grande have not contributed materially to the navigation of that stream since in the early eighties?

A. As this interrogatory is not propounded to me, I make no answer thereto.

280 72. Q. For how long a period during each year, and at what time of the year, is the amount of the water in the Rio Grande, in its navigable parts, substantially increased by flood flows coming in from its tributaries?

A. I know nothing of the inquiries made.

73. Q. During such period to what extent is that navigable depth of the Rio Grande increased, and how much is such stream widened?

A. I know nothing of the inquiries made in this interrogatory.

74. Q. When such floods come are the waters confined within the banks or do such floods rise over the banks of the Rio Grande and deposit water in lakes, lagoons, and depressions?

A. When there are floods in the Rio Grande the water overflows its banks and deposits its water in lakes, lagoons, and depressions.

75. Q. What portion of any particular flood, which may in a week or ten days pass Ringgold Barracks, will reach Brownsville? Does the amount of water which will reach Brownsville from such flood, lasting, say, a week, at the head of navigation, constantly decrease as it comes down the channel and deposit itself in such bayous and lakes, or is it absorbed by the sand?

A. I have no knowledge of the matters inquired about in this interrogatory.

76. Q. Have you any knowledge or information as to how far below El Paso water will run in the channel of the river before it is 281 absorbed and taken up by the sand, when for five days or ten days or thirty days, at El Paso, such water ran one foot deep and fifty feet wide, or when it ran at any other particular depth or width for any given period of time at El Paso?

A. I have no knowledge of the matters inquired about in this interrogatory.

77. Q. Do you know what would be the effect of a flood at El Paso, Texas, which ran a thousand cubic feet per second for one day or ten days or twenty days or thirty days, so far as increasing the depth and velocity of water in the river at Fort Quitman, Presidio del Norte, or the mouth of the Pecos, or Eagle Pass, or Rio Grande City, or Brownsville is concerned?

A. I have no knowledge of the matters inquired about in this interrogatory.

78. Q. Do you know how much the river would be raised at Rio Grande City by a flood passing El Paso, Texas, amounting to 15,000 cubic feet of water per second, and running for ten days at that rate?

A. I have no knowledge of the matters inquired about in this interrogatory.

79. Q. Do you know in the month of May, 1897, whether any flood entered the Rio Grande from either the San Juan, Salado, San Antonio, the San Rodriguez, Santiago, San Philipe, Devil's River, Pecos, or the Concho? If you, which one of these streams do you know of any flood entering the Rio Grande from during that month?

A. I have no knowledge of the matters inquired about in this interrogatory.

282 80. Q. Have you any knowledge as to whether any flood came from either one of those tributaries into the Rio Grande during that month? Please state which one of them you do not know with reference to.

A. I have no knowledge of the matters inquired about in this interrogatory.

81. Q. Do you know whether there was a flood from either one of those streams entering into the Rio Grande during the present calendar year? If so, which one of them had a flood and what month did the same occur in? If you do not know with reference to any one of the same during the present year, please state which one you do not know with reference to.

A. I do not know.

82. Q. In interrogatory seven you are asked to state your full knowledge of the effect of the ordinary flow of water and of the flood waters which come from above El Paso. As a matter of fact, have you had any personal observation which will enable you to state just what regular flow or flood flow comes from El Paso or above there, or are you simply depending upon hearsay as to that?

A. I know nothing of the matters inquired about in this interrogatory.

83. Q. Do you know anything about the amount of waters which have flowed regularly by El Paso since 1880 or previous thereto?

A. I know nothing of the matters inquired about in this interrogatory.

84. Q. What was the width and the depth of the water flowing in the Rio Grande, passed El Paso, in 1880? What was it in 1885? What was it in 1890? What was it in 1895? What was it in 1899?

283 A. I have no knowledge of the matters contained in this interrogatory.

85. Q. Do you know during what years between those dates, or previous to those dates, the river has been absolutely dry at El Paso for any considerable number of months in the year; and if so, what months?

A. I do not know anything of the matters asked about in this interrogatory.

86. Q. Do you know what flood flows passed El Paso in the years above named? Do you know how long the flood of 1897 at El Paso lasted?

A. I have no knowledge of the matters contained in this interrogatory.

87. Q. If you have testified as to any flood flows passing by El Paso during any of these years, state whether you were at El Paso and saw them, or whether you were simply guessing that they passed El Paso because you saw them at some point further down the river.

A. As I have stated, I knew nothing of these matters. I know nothing of the matters inquired about in this interrogatory.

88. Q. If you saw any floods down the river, at any navigable part thereof, during any of these years, is it not possible that they may have come from some of the tributaries of the Rio Grande above named?

A. I have seen no floods in the navigable parts of the river during the years mentioned.

89. Q. Is it not possible that such floods may have come from heavy rains along the Rio Grande below El Paso?

284 A. As I have seen no floods, consequently I know nothing of the matters inquired in this interrogatory.

90. Q. How far above El Paso were you ever? Did you ever come up the Rio Grande from the head of navigation to El Paso overland, and observe the flow of the Rio Grande along its entire course?

A. I have never been above El Paso, and have never come the Rio Grande from the head of navigation to El Paso overland.

91. Q. If, in answer to interrogatory eight, you state that you have personally observed the bed of the said Rio Grande as to hollows or depressions, and that the same is porous and capable of large absorption, or that the same has sloughs or bayous and arroyos which have a natural tendency to detract from its navigable capacity during a low stage of water, and which have to be filled before the river can be raised by floods and increased flows, please state what ultimately becomes of the water which is consumed by such porous character of soil, or which runs into such sloughs or bayous or arroyos?

A. I stated in the eighth direct interrogatory that I knew of hollows and depressions in the river, but knew nothing of the navigable capacity or absorption of the river, etc. Therefore, I know nothing of the matters inquired about in this interrogatory.

92. Q. Does this water stand in such sloughs and bayous until it is absorbed by the soil or by evaporation?

A. From the best of my judgment, it is absorbed by both absorption and evaporation.

285 93. Q. If you state that you have observed such sloughs and bayous, state how far up the river you have observed the same, and whether practically the same condition does not continue up the stream to El Paso and north of that place.

A. I have observed these sloughs and bayous but a short distance above Eagle Pass, and from this I can not say whether practically the same conditions exist to and above El Paso.

94. Q. If you state that such sloughs and bayous check and hold these waters and such waters sink into the sand and are absorbed, please state if these facts would not tend to constantly decrease any floods which might pass El Paso and so decrease the same as to practically consume it so that it would not substantially aid navigation where said river is navigable.

A. I have no idea as to what effect it would have upon that part of the Rio Grande which is navigable.

95. Q. If, in answer to interrogatory eight, you state that the flood waters of the river are necessary to fill bayous and depressions in order to keep the regular current flowing down, then please state whether, in your opinion, that result is the greatest good produced by these floods. As matter of fact, the floods are treacherous, are they not?

A. As I do not state in the answer to the eight' direct interrogatory that these sloughs and bayous are filled by the floods of the Rio Grande, I know nothing of the matters inquired about in the last cross-interrogatory, except that I know the floods which take place in the Rio Grande are of a treacherous character.

286 96. Q. Are you acquainted with the steamer "Bessie;" and if so, what relation towards it do any of you bear? Can the steamer "Bessie" come up the Rio Grande against the flood coming down the stream with any considerable force?

A. I have no knowledge of the matters inquired about in this interrogatory.

97. Q. It is a fact, is it not, that it is exceedingly trying and dangerous to the safety of the vessel and the progress of the same to undertake to navigate the river depending upon the flood flow?

A. From my own knowledge I know nothing of the matters inquired about in this interrogatory.

98. Q. It is true, is it not, that if the steamer comes up the Rio Grande during a flood it is exceedingly liable to be stranded by reason of the subsidence of the flood before the steamer reaches its destination?

A. I have no knowledge of the queries set out in this interrogatory.

99. Q. Can the steamer "Bessie" come up the Rio Grande at all during the heaviest flood flows which occur along its navigable course? Is it not true that she can better navigate when the floods are not greatest, and that if the excessive floods were lessened she would make quicker and safer trips?

A. I know nothing of the matters contained in this interrogatory.

287 100. Q. How many irrigating ditches do you know of from the vicinity of El Paso to Brownsville, Texas? If any, where are the same located and how much of the Rio Grande do they divert, and on which of the river are they—on the American or Mexican side?

A. I know no knowledge of the existence of irrigation ditches on either side of the Rio Grande from El Paso to Brownsville.

101. Q. In direct interrogatory tenth you are asked what would be the effect of storing water 125 miles above El Paso, Texas, so far as the navigability of said river is concerned. Do you know a point named as Elephant Butte, about 125 miles above El Paso, Texas? Were you ever at such point? Do you know whether the bed of the proposed reservoir at Elephant Butte is sandy, or whether the river at that point flows through a rocky cañon? When were you there?

A. I do not know anything of the matters asked in this interrogatory.

102. Q. Do you know the character of the bed of such stream below Elephant Butte down to a point of rocks just above Las Cruces, New Mexico? What is the character of the bed of such stream at such point?

A. I have no knowledge of the matters inquired about in this interrogatory.

103. Q. Have you ever been connected with an irrigation company or had any experience in the use of waters of reservoirs? If so, where, and what experience have you had? How large was the reservoir with which you had such experience?

A. I have never been connected with irrigation companies, nor have I had any experience in the use of reservoirs.

288 104. Q. Do you know what per cent of the waters which would be impounded by a dam thrown across the river 125 miles above El Paso, Texas, would pass off by evaporation?

A. I have no knowledge of the matters contained in this cross-interrogatory.

105. Q. Suppose such dam held water fifty feet deep, ten miles long, and a mile wide—what amount, in depth, of such water in such place, would pass off by evaporation, and how do you know that?

A. I have no knowledge of these matters.

106. Q. Do you know how much such water, when being let out of such dam and used in the neighbourhood thereof for irrigation, without being taken out of the valley of the Rio Grande, would return to the Rio Grande and contribute to its flow? If so, what per cent would so return? What would become of the balance of the water? What part would pass off in vegetation? What per cent of what is lost would be due to absorption?

A. I have no knowledge of these matters.

107. Q. What would be the effect upon the flow of the river at its navigable parts if the water of the stream so impounded at this point, 125 miles above El Paso, and used, as is asked in direct interrogatory tenth, for manufacturing purposes, and let back into the river *into* such quantities as would be sufficient to supply all ordinary manufacturing purposes which might be located thereunder?

A. In my judgment the water of the stream diverted for manufacturing purposes and afterwards left back into the river in sufficient quantities to supply the needs of manufacture, would effect the flow of the river at its navigable parts.

289 108. Q. As matter of fact, have you sufficient technical knowledge to be certain what the effect of impounding the waters of the Rio Grande 125 miles above El Paso and using them along the banks of the stream for irrigation would have upon the flow? Do you not know it to be a fact that such acts would tend to equalize the average flow of such river?

A. I have no technical knowledge of the effect of the impounding of waters would have upon the Rio Grande, nor do I know this would equalize the average flow of the river or not.

109. Q. If 500 cubic feet of water per second were taken out of a reservoir constructed 125 miles above El Paso, how much of it would reach El Paso and how much of it would be lost in the bed of the river itself by absorption and evaporation?

A. I have no knowledge of these matters.

110. Q. If five hundred feet of water reached El Paso, Texas, traveling down the bed of the stream, after having been turned out of the reservoir 125 miles above El Paso, how much of it would be diverted out of the stream by the Juarez Dam at El Paso and flow off down the Juarez Canal on the Mexican side, and how much of it would be diverted by the El Paso wing dam and flow down to El Paso?

A. I have no knowledge of these matters.

111. Q. If you have stated that the flood of waters of the Upper Rio Grande ever reached the lower portion of the river, please state at what season of the year the floods usually come down the river.

A. As I have not stated that the flood waters of the Upper Rio Grande ever reached the lower portion of the Rio Grande, I have no answer to make to this interrogatory.

290 112. Q. If any of the flood waters from El Paso or above ever come down the Rio Grande, and you have undertaken to state

that there are any sloughs, bayous, or arroyos in the bed of the stream which such flood waters might fill up or that such flood waters do actually fill up the same, please state when the flood waters fill the same and how long the waters remain therein. State if it is not a fact that even if enough flood waters come down to fill the sloughs, bayous, and depressions in the bed of the Rio Grande that such flood waters would and do evaporate or disappear before the perennial flow of the Rio Grande comes down the same.

A. I have stated that the floods filled the depressions, etc., but I do not know when this flood waters fill the same, nor do I know how long they remain in the same. As to the latter part of the interrogatory, I know nothing.

113. Q. Have not the floods of the Rio Grande at Presidio, Rio Grande City, Laredo, Eagle Pass, and Brownsville been greater during the present year than they have been for many years previous? If you answer that they have not, please state during what years within the past ten years, and during what month in such years, there have been heavier floods than during the present year. In your answer name each year during the last ten years and the month or months of each year during which the floods have been greater than they have during the present year at the points mentioned. And state if you know that the highest water reached by the river at each of such points during the present year and the time of such high water and the highest water at each of said points during the past ten years.

A. My knowledge of the greatness of the floods is confined to the floods that take place at Eagle Pass, and I can say that on the 14th of June of this year the river has risen higher than I have ever seen it and was the largest flood I ever seen at Eagle Pass. I do not know how high the river rose at this point.

291 114. Q. With whom have you conversed about giving testimony in this case? Were you asked to come in person at the trial of this case and give your personal evidence by anyone; and if so, whom? When did you first see or have read to you the interrogatories and cross-interrogatories which have been propounded to you, and who first showed them to you and told you of the same?

A. I have not conversed with anyone regarding this case. W. P. Sutton informed that interrogatories would be sent here, but did not impart to me the nature of the interrogatories. I have not been asked by anyone to attend the trial and give evidence in this case. I never saw or had read to me the interrogatories and cross-interrogatories in this case until they were read to me by the commissioner taking my deposition, and had no knowledge of the succeeding interrogatories until the interrogatories were consecutively propounded to me by the commissioner and the same answers taken down.

115. Q. Have you read over such interrogatories or cross-interrogatories with anyone previous to having the same propounded to you by the officer taking your deposition? If so, with whom did you read over the same?

A. I have never read the interrogatories or cross-interrogatories, nor have they been read over to me previous to the officer propounding the same to me in taking my deposition.

116. Q. Has anyone written out for you or furnished you with a written answer or suggested a written answer which would be suitable to any of the interrogatories or cross-interrogatories which have been submitted to you? If so, who has done so?

A. No one has written out for me nor has anyone suggested the answers which I should make to any of the interrogatories.

117. Q. Has anyone suggested any portion of the answers or any portion of an answer to these interrogatories? If so, whom?

A. No one has suggested to me an answer or part of answer that I should make to these interrogatories.

118. Q. Do you speak English, or have the questions been translated to you? If so, have your replies thereto been translated into English before being written down?

A. I speak and understand English.

119. Q. In whose presence, and where, and on what day have you given these answers? Name every one who has been present while you were giving this testimony, listening to the same. Has any attorney been present? If so, give his name, and state whether he was the attorney for plaintiff or for the defendant.

A. I have given these answers in the presence of the commissioner. There were present during the taking of my deposition the commissioner, the stenographer, and myself, the witness. There was no attorney present either for plaintiff or for defendant. My depositions were taken in the court-house in Eagle Pass, Maverick County, Texas, on the 29th day of November, 1899.

120. Q. Has anyone representing the United States Government or pretending to so represent it been present at the taking of this testimony? If so, state his name.

A. No one representing the United States Government or pretending to represent such Government has been present during the taking of my deposition.

(Signed)

JESSIE SUMPTER.

WILLIAM SCHUEHARDT, a witness on behalf of the United States, living at Eagle Pass, in the State of Texas, having previously giving his testimony by deposition, taken on direct and cross-interrogatories, the said deposition was then read in evidence, as follows:

Interrogatory 1. Q. What is your name, age, residence, and occupation?

A. My name is William Schuehardt; my age is 68; my residence is San Antonio, Texas; occupation, Marina Hospital guard, at Eagle Pass, Texas.

Interrogatory 2. Q. When did you first see the Rio Grande; how long have you had personal observation of it; and over what part of it has your personal observation of it extended? State fully.

A. I first saw the Rio Grande in 1858 at Camargo. I have had personal observation since 1863 at Piedras Negras, at which point I arrived. My observation have been confined to the vicinity of Piedras Negras.

Interrogatory 3. Q. State what you know, if anything, by personal experience, if you have any, as well as by personal observation, of the navigation of said river, the character of such navigation, the amount

and expense thereof, and the time when such experience and observation began and ceased?

A. The only navigation I have observed have been the boats going from one side of the river to the other, and ferryboats between Eagle Pass and C. P. Dias (Piedras Negras). Ever since 1863 I have observed this navigation.

Interrogatory 4. Q. State what you know, from personal observation and experience, or either, concerning the navigable capacity of said river when you first knew of the same, mentioning that part of its course
294 which had a navigable capacity, and what portions of the year it was navigable, naming the months or parts of months, according to your best recollection.

A. I know nothing of the navigable capacity of said river, except from my personal observation, as above stated, and as to that between Eagle Pass and C. P. Dias. Ferryboats could cross the river at all seasons of the year.

Interrogatory 5. Q. State, from your personal observation or experience, or both, whether, since your first knowledge, if you have any, any change has occurred in the navigable capacity of said river, and as nearly as you can, the year when such change became observable; the nature of such change, if any; its extent, and any circumstances which from time to time occurred to impress such change upon your mind.

A. As regards the navigation of ferryboats it has remained same except during floods; the navigable capacity of the river has been the same at points mentioned.

Interrogatory 6. Q. State, what, if anything, you know by personal observation, of the character of the streams which flow into the Rio Grande between its mouth at the Gulf of Mexico and the city of El Paso, Texas; as to the color of the waters of the same, if they have any peculiar colors; the extent of the waters they contribute to the Rio Grande; the time of the year when each is accustomed to furnish the greatest volume; and any other facts and circumstances, within your personal knowledge, affecting the navigable capacity of the river.

A. The only knowledge I have of waters which flow into the Rio Grande between the Gulf of Mexico and El Paso are the rivers Escondida, San Rodriguez, and San Diego, the colors of which rivers are clear. I have no idea of the extent of the waters they contribute to the Rio Grande. I have no knowledge of the extent of the waters contributed, but it is considerable. The streams mentioned furnish the greatest volume of water in the fall, when rains occur in Mexico. I know nothing
of their effect upon the navigable capacity of the river.

295 Interrogatory 7. Q. State what, if anything, you know of the color, nature, and extent of the waters of the Rio Grande at and above El Paso, Texas; and, in this connection, state what you know or have known, from year to year since you know it began, of the effect of the flood waters or so-called torrential flow; as to the time of the year when the same became manifest in navigation; and also state the same of the ordinary flow of waters or so-called perennial flow—all of this, as far as your knowledge will permit, as to waters coming from and above El Paso.

A. I do not know anything of the nature, color, or extent of the waters above El Paso.

Interrogatory 8. Q. State what you know from personal observation of the character or bed of the said stream as to hollows or depressions, as to whether the same or any part is porous and capable of rapid absorption of water; as to sloughs or bayous and arroyos, so called, or any other features outside of evaporation which would have a tendency to detract from the navigable capacity during a low state of water, and required to be filled before water coming down stream could be useful, intending to raise the river to a navigable height.

A. I know that there are hollows and depressions in the bottom of the river, but as to whether they are capable of absorption I do not know, nor do I know what effect they would have upon the navigable capacity of the river.

Interrogatory 9. Q. State whether, within your knowledge of the river, there have been any changes in cutting timber along the stream, or of any other nature than the diversion of the water for mining and irrigation purposes, tending to impair or reduce the navigability of the stream in that part of the same where it was navigable when you first knew it.

A. At the portion of the river with which I am acquainted, 296 there never was any timber to cut of any consequence. I know of no diversion of water for mining and irrigation purposes.

Interrogatory 10. Q. State whether, from your experience and knowledge of the said river, the construction of a dam and the storage or impounding of any considerable quantity of water and the diversion of the same for manufacturing purposes, at a point across the same about 125 miles above El Paso, Texas, in the Territory of New Mexico, would have any influence upon the navigability of said river where it is now navigable; and if any, what that influence would be. Of this state fully, giving reasons.

A. I think that the construction of a dam and the diversion of the water of the Rio Grande would affect the navigability of said river at the point where it is now navigable, if navigable at all.

Interrogatory under Rule XXXIX. Q. Do you know or can you set forth any other matter or thing which may be of benefit or advantage to the parties at issue in this cause, or either of them, or that may be material to the subject of this your examination or the matters in question in this case? If yes, set forth the same fully and at large in your answer.

A. I know of nothing further regarding this question which can enlighten either side.

297 And the cross-interrogatories propounded to the said witness at the time of the taking of the said deposition aforesaid, and his answers to the same, were thereupon read in evidence, as follows, that is to say:

1. Q. How long have you resided at the place of residence named by you, and how long have you been engaged in the business named by you in your direct examination? Where and at what place have you resided other than at the places so named by you, and from what time to what time at each of such places, and what other occupations have you been engaged in, and from what time to what time have you been so engaged in the same?

I think I have lived in San Antonio about three years and have a

marine guard since the 16th of September, 1899. I have resided in Parras, Mexico, in Piedras Negras, Mexico, and have resided in Eagle Pass before I moved to San Antonio. I resided at Parras, Mexico, from about 1886 to 1890; in Piedras Negras from 1863 to 1885, and in Eagle Pass from 1890 until about 1895. During the time I resided at Piedras Negras I was engaged in the mercantile business. In 1867 I was appointed United States commercial agent at Piedras Negras. I held this until 1886, when I was removed.

2. Q. Are either of you now, or have you been, in the employ of the United States in any capacity, or have you worked for or been in the employ of the International Boundary Commission between Mexico and the United States; and if so, in what capacity?

A. I have already stated that I am in the employ of the United States. I have never been employed by the International Boundary Commission between Mexico and the United States.

3. Q. If, in answer to direct interrogatory number two, you undertake to state how long you have had personal observation of the Rio Grande, and over what part of it your personal observation has extended, please state how much of this river you have ever been over, and give the highest point on it you were ever on in person and how often you
298 have been to such point in person.

A. My personal knowledge has only extended from three miles below Piedras Negras C. P. Dias (the same town) to three miles above.

4. Q. If you have stated that you have been on the Rio Grande and given the highest point at which you have been, please state whether you have traveled over the intermediate points between such highest point and Brownsville, Texas, in person; and if so, please state what intermediate points you have traveled over, and how often you have been over such intermediate points, or any particular one of the same, describing such point.

A. I have never traveled over the intermediate points between Piedras Negras and Brownsville, Texas.

5. Q. If you have stated that you have had personal observation of any portion of the Rio Grande, please give the length in miles, measuring by the course of the river, that you have had personal observation over, and the length of the same measured in a direct line between the highest point and the lowest point which has been covered by your observation.

A. The computation of the distance between the points I have been on has been made by the course of the river. There would be but little distance difference if measured in a direct line.

6. Q. If you have stated that you have had personal observation of any portion of said river, please name the tributaries which said river has on that portion of it covered by your observation and also;
299 please state the distance from tributary to tributary coming up the river, and whether such tributaries come in on the American or Mexican side of the river?

A. The Escondida is the only river flowing in the Rio Grande on that portion I have observed, and this flows in on the Mexican side.

7. Q. If you have named any tributaries which come into the Rio Grande, or have stated that you know of any tributaries that come into the same, please state all the facts which you know with reference to such

tributaries, and state where they rise, how long they flow, whether the valleys of such tributaries are settled or unsettled, whether the waters of such tributaries are used for irrigation or mining purposes, how such tributaries are used for irrigation or mining purposes, how much land is cultivated on each tributary, and whether the waters of such tributary are used for irrigation or mining purposes.

A. The Escondida rises about 100 miles W. N. W. from Piedras Negras and from where it flows into the Rio Grande. The valleys of the Escondida are settled. The waters of this river are used for irrigation purposes. I do not know how much land is covered by this tributary.

8. Q. If you have stated that any of the waters of the tributaries of the Rio Grande are used for irrigation or mining purposes, please state how much of the same and how long they have been so used, and state how much land is cultivated on each tributary by means of the water of the same and what portion of the waters of such tributaries are used for irrigation or mining purposes.

A. The waters of the tributary mentioned have been used for 300 irrigation ever since I can remember, but I can not state the length of time the waters have been put to such use nor the quantity of waters used. I know that there is a large area of land cultivated by said tributary, but can not approximate the number of acres.

9. Q. If you have stated that any part of the water of such tributaries so flowing into the Rio Grande is used for irrigation or mining purposes, please state at what point on the same the waters are diverted from the streams for such purposes, and whether more or less water is now used on each of such tributaries, naming them, than was formerly used; and if so, when the increase or decrease in such use commenced and when it reached its maximum.

A. I know that the water which is diverted from Escondida is taken out at various points, but do not know the distance from the mouth of the same. From my recollection there is more water used now than formerly. I think the increase in the amount of water diverted commenced in about 1875. At the time of the last diversion, in 1875, I believe it reached its maximum.

10. Q. If you have stated that you know of any of the tributaries of the Rio Grande, please state whether any dams or reservoirs are on any such streams, naming them; and if there are, where the same are situated, and in or across what stream they are constructed, and when they were constructed, and whether any of the same were constructed by authority of the Mexican Government or by its permission, if you know.

A. I know that there are dams and reservoirs, and I know that they could only be constructed after authority being granted by the Mexican Government.

11. Q. If you have stated that you are acquainted with any of such tributaries of the Rio Grande, please state whether the flow of the same was or is constant, or whether the same is spasmodic or intermittent, 301 describing in detail in this respect each particular tributary; and also state whether such streams are known as flood streams or perennial streams, and at what seasons of the year their floods generally come, if they are flood streams, or if large floods come down the same, and how long such floods last, and what becomes of such floods.

A. The flow of the Escondida is constant. They are perennial streams, and the floods usually come in September. They are not regular. Large floods sometimes come down the streams. Floods last but a few days. The floods flow into the Rio Grande, and by reason of this increase it adds to its navigable capacity.

12. Q. If you have stated anything with reference to the navigation of the Rio Grande, please state the highest point on such river to which permanent navigation has ever extended.

A. I have no knowledge of the inquiries made in this interrogatory. All the knowledge I possess as to the navigation of the Rio Grande is from hearsay.

13. Q. If you have stated that you know anything with reference to the navigation of the Rio Grande, please state how many boats were ever used and employed in such permanent navigation and how many are now used in the same, and what was the size and capacity of each of said boat or boats and how much water each thereof drew, and how often such boats ascended or descended such river during each year, and during what months during the year they made their ascents and descents.

A. I do not know anything of the matters inquired about in this interrogatory.

302 14. Q. If you have stated anything about any boats that navigated the Rio Grande at any time, please state whether such boats made their trips on such river on schedule time, and whether there were particular days of departure which were adhered to or whether the trips were only occasional, intermittent, and without knowledge on the part of the public or boatman as to when the boats would arrive at or depart from terminal or intermediate points at which they touched.

A. I do not know anything of the matters contained in this interrogatory.

15. Q. If you have stated that there ever was any navigation on the Rio Grande, or is any navigation on it now, please state to what extent the points and people along said river depended upon such navigation for commercial purposes in the past, and to what extent they depend on the same at present, and as to whether they did in the past, or do now, depend mostly on such navigation, or do they depend mostly upon freighting to and from railroads and commercial centers.

A. I do not know anything of the matters inquired about in this interrogatory.

16. Q. Please state how long, in recent years, it would usually take a boat to ascend the Rio Grande from Brownsville, Texas, to Rio Grande City, and give the distance between Brownsville and Rio Grande City, when measured by the course of the river, and also the distance between said points along the usual traveled wagon road between the same.

A. I know nothing of the matters inquired about in this interrogatory.

303 17. Q. Have you not personally observed hulls or wrecks of old boats inside the bar at the mouth of the Rio Grande and up the course thereof and some distance therefrom?

A. I have never observed any wrecks or the hulls of old boats up the Rio Grande, inside the bar, or at the mouth of the Rio Grande.

18. Q. If you have said you observed any hulls or wrecks of old boats,

as interrogated about, please state how these boats got there, and how far up the river their wrecks were observed by you, and state if you know how they came to be wrecked and when they were wrecked.

A. I know nothing of the matters inquired about in this interrogatory.

19. Q. As matter of fact, is it not true that such boats got into the river over the bar at the mouth thereof? And is it not a fact that many of them were cut in two in order to get them over the bar, and were afterwards abandoned by the parties undertaking to use them? And, if "yes," state how long ago this occurred, and the reason, if you know, why the boats were so abandoned.

A. I know nothing of the matters inquired about in this interrogatory.

20. Q. If you have stated that you know anything of the character of such navigation, state whether or not vessels can come in from the Gulf of Mexico to the mouth of the Rio Grande at the present time, and how far up the river they can come from such Gulf. If you say they cannot come into the mouth of such river or up the same, please state what prevents them from so doing.

A. I know nothing of the matters inquired about in this interrogatory.

21. Q. Is there not an obstruction at the mouth of the river Rio Grande which prevents boats from going into the same from the Gulf of Mexico; and if so, what is such obstruction?

A. I know of these matters inquired about.

22. Q. Do you know how much fall there is in the course of the river from Ringgold Barracks to the Gulf of Mexico per mile?

A. I do not know anything of the matters inquired about in this interrogatory.

23. Q. What is the character of the current of the river Rio Grande immediately above its entrance into the Gulf of Mexico?

A. I do not know anything of the matters inquired about in this interrogatory.

24. Q. Has the Rio Grande, for several miles from the mouth of the same, any appreciable current?

A. I do not know anything of the matters inquired about in this interrogatory.

25. Q. How far up the course of the river Rio Grande do the tides of the Gulf of Mexico affect the depth of the water in the river, and at what season of the year are these tides heaviest; and when at their heaviest how far up the river do they affect the current of the same?

A. I know nothing of the matters asked about in this interrogatory.

26. Q. In describing the character of the navigation which you testified with reference to, please state what the average depth of the water near Brownsville is during the period when it is usually deepest, and how far up the river the depth continues the same.

A. I know nothing of the matters asked about in this interrogatory.

27. Q. At what period of the year is the depth of the river Rio Grande at Brownsville the greatest, and at what period is it the shallowest; and for how long does the depth continue at its maximum, and how long does it continue at its minimum?

A. I know nothing of the matters contained in this interrogatory.

28. Q. How shallow does the water get in the river at Brownsville?

A. I know nothing of the matters asked about in this interrogatory.

29. Q. What character of bed has the river Rio Grande, and is the bed of the same permanent or is it shifting? Is it rocky or is it sandy? Are there any shallows in it or any sand banks in it?

A. At the places I have observed the river the bottom is rocky and is shifting—it changes its channel; both rocky and sandy; there are shallows in it; there are sand banks in it.

306 30. Q. If you have stated that there are either shallows or sand banks in the bed of the Rio Grande River, please state whether the same are below Rio Grande City, and if they are sufficient to in any way impede the navigation of the river; and if they are, for how long do they impede navigation?

A. I have referred to the shallows and depressions observed by me in the Rio Grande, and have no knowledge of them below Rio Grande City.

31. Q. If you have stated what the condition of the bed or depth of the Rio Grande River is, please state how long such conditions have maintained within your knowledge.

A. They have existed ever since I have known the river.

32. Q. Was there ever, at any time within your knowledge, any great permanency to the channel of the Rio Grande River, so far as depth and course are concerned, or was the depth and course of the same constantly changing?

A. The depth and course of the same was constantly changing, according to my observation, and there is no great permanency on the channel of the Rio Grande River.

33. Q. What effect, so far as changing the banks and the bed of the Rio Grande, would the heavy floods which came down the river have?

A. It has the effect of changing the bank and the bed of the river from one side of the river to the other.

34. Q. How often during a trip up or down the river did the boat or boats which navigated the same ground upon these sand bars or shallows?

307 A. I know nothing of the matters inquired about in this interrogatory.

35. Q. Did any one of you ever navigate the river Rio Grande on the steamer known as the San Ramon, or a steamer bearing that character of name? If so, was that the correct name of such steamer? And if not, please give its correct name.

A. I know nothing of these matters.

36. Q. If any of you have said that you have navigated the Rio Grande River in the steamer referred to in the last preceding interrogatory, state whether any of you have any personal recollection of a trip that such steamer made in the first half of the year 1873, when it took 42 days, or thereabouts, to go from Brownsville to Rio Grande City; and if so, state what caused it to take such length of time, and how long it took such boat to go back down the river from Rio Grande City to Brownsville. And, if you state that it only required a few hours or a short time to do so, please state why such steamer was enabled to go back down the river more rapidly.

A. I know nothing of the matters asked about in this interrogatory.

37. Q. Do you remember that on the trip referred to in the last interrogatory, after said boat reached Rio Grande City, a flood came down the river and furnished sufficient water to float the boat back down the stream without touching on the bars or shallows?

A. I know nothing of the matters inquired about in this interrogatory.

308 38. Q. In describing the navigation of the Rio Grande, please state whether the same was in the past ever a financial success; and if so, during what period it was financially successful, and whether during the period it was so successful the navigation of the river was aided by either the Government of the United States or the Government of the Republic of Mexico.

A. I know nothing of the matters asked about in this interrogatory.

39. Q. Please state whether or not the navigation of the Rio Grande River at the present time is successful or otherwise.

A. I know nothing of the matters inquired about in this interrogatory.

40. Q. Please state what the ruling price per hundred pounds, and also per ton, has been in the past, within your knowledge, for transportation between Brownsville and Rio Grande City, when carried by boat, and what the ruling price per hundred pounds and per ton river freight now brings on the steamboat "Bessie," between such points; and state whether there is any other steamboat plying the said river at the present time besides the "Bessie."

A. I know nothing of the matters inquired about in this interrogatory.

41. Q. In connection with the shipment of freight up and down the river Rio Grande, state whether there are any railroads which were built along the same for any distance, on either the Mexican or American side, or which compete with the steamer "Bessie," and on which side of the river such railroads are built, and the termini of the same, and when the same were completed, and for what commercial purpose the same were built.

A. I know nothing of the matters inquired about in this interrogatory.

42. Q. Please state where the goods and supplies that are shipped over any such railroad for the Rio Grande country are delivered to the road.

A. I know nothing of the matter inquired of.

43. Q. Before this railroad was built what method was there of getting shipments of freight into Rio Grande City from distant points other than by navigation from Brownsville, and what was the cost per hundred pounds or per ton of getting such shipments by such means?

A. I know nothing of the matters inquired about in this interrogatory.

44. Q. Before such railroad was built were not the rates for river freight greatly in excess of the rates put into effect by such railroad, and which now obtain on points along the Rio Grande River; and is not freight on goods and supplies shipped over the railroad and by boat to points along the river Rio Grande now very much less than before such railroads were built? If so, was not the reduction in such freight rates caused by the construction of such railroad, and did not the construction

310 of such railroad thereby cause the declining in the navigation of the river Rio Grande?

A. I know nothing of the matters asked about in this interrogatory.

45. Q. Could the navigation of the river from Brownsville up the stream be carried on after the construction of such railroad so as to successfully compete with the same in their freight rates between their termini and intermediate points along such river, and is not the decline of navigation on said river due to the inability of boats to compete with freight rates put in effect by such railroad?

A. I know nothing of the matters inquired about in this interrogatory.

46. Q. Do you know the location of Comargo; and if so, how long have you known it, and was there ever any considerable amount of freight ascended such river on boats to Comargo to such point?

A. I know the location of Camargo, but know nothing of the amount of freight which ascends the river to Camargo.

47a. Q. Was not Comargo a center for the supplying of interior points of Mexico, even at great distance away therefrom? If it was, at what distance? Please state what sized place Comargo is now and what size place it was prior to the building of such road, and if it is a place of less size now. Please state if it is not also of less commercial importance than formerly. State if you know what has caused the decline of Comargo in population and commercial importance.

311 A. I know nothing of the matters inquired about in this interrogatory.

47b. Q. Was not this decline of Comargo due to the construction of the Mexican International Railroad, running between Laredo and the interior points of Mexico and connecting at Laredo with points in the United States? Does not such railroad now supply the interior points of Mexico which formerly contributed to the commercial importance of Comargo at cheaper rates of freight than could be had by navigation of the river?

A. I know nothing of the matters contained in this interrogatory.

48. Q. If you have stated that any change has occurred in the commercial capacity of the Rio Grande River, and have undertaken to state the nature of such change, please state whether such statement made were all founded upon personal observations made by you or are partly or wholly suppositions or theories.

A. I know nothing of these matters inquired about, as I have stated nothing of the character mentioned.

49. Q. If you have undertaken to state that there are any changes in the navigable capacity of the Rio Grande River, please state what the effects of such changes were in the increase or decrease of the flow of the river at Brownsville. How much depth, more or less, did the river take on at Brownsville and what was the effect? How much depth was there, more or less, at intermediate points between Brownsville and Ringgold Barracks, naming each place of prominence at which the water became deeper or shallower? At what points did you observe this effect? How often during the year when such effect was worked did you observe the same? How long did such effect continue?

A. I know nothing of the matter contained in this cross-interrogatory.

50. Q. Do you know whether in the year when such effect was first observable, or within a year or so before the same was observable, there was any use commenced of any of the waters of any of the tributaries of the Rio Grande for purposes of irrigation or otherwise? If so, to what extent were such waters of such tributaries used?

A. I know nothing of the matter asked about in this cross-interrogatory.

51. Q. Did you know where the San Juan River empties into the Rio Grande? Does it come from the American or Mexican side? What was the amount of water contributed by the San Juan to the Rio Grande when you first knew the Rio Grande? Was it a considerable stream or an insignificant one? State how wide it was, and about how deep, and about the rapidity of its current where it emptied into the Rio Grande, if you know.

A. The San Juan River empties into the Rio Grande at Camargo. It comes from the Mexican side. I have no knowledge of the amount of water contributed, but it was a good-size river. I do not know the depth or the width of the San Juan River, nor do I know the rapidity of its current where it falls into the Rio Grande River.

52. Q. If you have stated that there was any change in the navigable capacity of the Rio Grande, commencing at any period named by you, state whether during the year of such change or subsequent thereto the flow of said San Juan River was more or less than it has been in past years. And is the flow of such San Juan River more or less now than it was when you first became acquainted with the Rio Grande? If so, to what extent has it increased or decreased? State, if you know, the cause of such increase or decrease. Are its waters now used for irrigation at any point on its course?

A. I know nothing of the matters inquired about in this cross-interrogatory.

53. Q. Please state if, before any change which you may have referred to in the navigability of the Rio Grande took place, you were acquainted with the amount of water flowing into the Rio Grande from the Salado, the San Antonio, the San Rodriguez, the Santiago, the San Philippe, Devil's River, Goodenough, the Pecos, and the Concho. If so, state where each of those rivers or any one thereof with which you may be acquainted comes into the Rio Grande, with reference to the location of Rio Grande City; that is, the number of miles above such city the mouth of such rivers are. State about what was the size of each of those streams, the depth, width, and velocity of current at the point where the same entered into the Rio Grande. Please state which ones of said rivers were larger and which smaller than the others; also whether there had been any decrease, at the time of any change in the navigability of the Rio Grande occurred, in the flow of either of such streams. If so, which decreased in its flow from the time when you first knew the same up to the time when the navigable capacity of the Rio Grande underwent any change?

A. I know nothing of the matters inquired about in this cross-interrogatory.

54. Q. As matter of fact, were you ever personally at the mouth of any of these streams? If so, please name the same, and state when and often you were there previous to such change in the navigable capacity of the Rio Grande; also, how often you have been there subsequent to such change in the navigable capacity.

314 A. I know nothing of the matters inquired about in this interrogatory.

55. Q. If, in answer to the foregoing question, you should state that there has been any decrease or increase in the amount of water flowing in any of the tributaries above named since the time when you first knew the same, please state, if you know, what has caused such increase or decrease.

A. As I have stated nothing regarding the increase or decrease of the quantity of water in any of these streams, I know nothing of the matters inquired about in this cross-interrogatory.

56. Q. Do you know that the flow of such tributaries and of the Rio Grande varies any changes in accordance with the amount of rainfall which occurs from year to year over the watershed drained by such Rio Grande and its tributaries?

A. I believe that the flow of water of the Rio Grande and its tributaries changes with the amount of rainfall.

57. Q. Do you not know that for a great many years past the rainfall in the watersheds adjacent to the Rio Grande and these tributaries in that section of Texas and Mexico has decreased and is now less than it was in the years immediately preceding 1887 and 1888?

A. I do not know anything of the matters asked about in this interrogatory.

58. Q. As matter of fact, has there not been a drouth in that section of the country since in the eighties, and has not this drouth resulted in the death of the greater portion of cattle and sheep, and even during periods necessitated the removal of portions of the population in various places along the river?

A. There has been a drouth in that section of the country since the eighties. A great many cattle and sheep have died as a result of that drouth. I do not know whether the inhabitants of that section of the country where the drouth took place were forced to remove or not.

59. Q. As matter of fact, is there now one-half as much rainfall as there was in that section of country in such former years?

A. I believe that there is more than one-half the rainfall in that section of the country now than there has been in former years.

60. Q. If, in answer to the sixth direct interrogatory, you state that you know anything by personal observation as to the colors of the water of any stream which flows into the Rio Grande between its mouth, at the Gulf of Mexico, and the city of El Paso, Texas, please state how you know the same.

A. I know the color of the waters of the rivers described in the 6th direct interrogatory by personal observation.

61. Q. At what points above the head of navigation did you ever observe personally the colors of the waters of any such tributary, and how many times did you ever observe the color of such water above the head of navigation?

A. The points at which I have personally observed the colors of the waters were near Piedras Negras, Mexico. My observations were made daily in passing said river. I do not recollect the exact number of times, but have observed the same very often.

62. Q. If, in answering interrogatory number six, you have stated that you knew the color of any water, did you answer from having seen the same during your navigation of the river and after such

water had mingled with the waters of such stream where navigable, or did you get your idea of the color from having seen it come out of the tributary before it had entered the Rio Grande?

A. I answer from having seen the same while on the rivers named and before the waters of these rivers emptied into and mingled with the waters of the Rio Grande River.

63. Q. Can you tell the color of the water of each of the following tributaries respectively, San Juan, Salado, San Antonio, San Rodriguez, Santiago, San Philippe, Devil's River, Pecos, and Concho? If so, please state the color of each one separately.

A. I have no knowledge of the color of the San Juan River; the Salado at the point of my observation was clear; I do not know the color of the waters of the Rio San Antonio; the color of the San Rodriguez River is clear; the San Diego is also clear; I do not know the color of the waters of the San Felipe, Devil's River, Pecos, and Concho.

64. Q. What is the difference between the color of the Pecos and of the Concho? What is the difference between the color of the Concho and of the Rio Grande before the Concho empties into it?

A. I do not know what the difference of color is between the Pecos and Concho rivers; I do not know what the difference is between the colors of the waters of the Concho and the Rio Grande before the Concho enters into the Rio Grande.

65. Q. If you undertake to tell the color of each one of these tributaries, state how you know the same and whether your statement is derived from hearsay or from actual observation.

A. As I have not stated the colors of these tributaries, I know nothing of the matters inquired about in this interrogatory.

66. Q. Were you ever at El Paso, Texas? If so, when and how often? Did you ever see the Rio Grande at such place? If so, what was the color of the Rio Grande at that place?

A. I have never been to El Paso, Texas.

67. Q. Do you know that the color of any tributary of this stream is liable to vary and change greatly from time to time, in accordance with the droughts, the light floods or the excessive floods or even the particular dry arroyos through which such floods from time to time enter such tributaries?

A. I know nothing of the matters contained in this interrogatory.

68. Q. Do you know of a heavy rainfall comes upon any particularly timbered section of a watershed of one of these tributaries making a flood in the tributary itself, that the color is liable to be very greatly different from the color of a flood in such tributary caused by an excessive rainfall in the nontimbered parts of the watershed of such tributary?

A. I know nothing of the matters inquired about in this interrogatory.

69. Q. If you say that you knew the color of the floods of the Pecos River which empty into the Rio Grande, please state whether in recent years there has been any change in the color of the Pecos floods.

A. I know nothing of the colors as to their changes in the Pecos River.

70. Q. Witness Kelly is asked whether he is the same man who made an affidavit to be used in the trial of the injunction which was granted in this case, in 1896 or 1897, and whether it is true that he therein stated

that he had not observed or heard remarked on the river any reference to waters which, from their color, appeared to come from the Upper Rio Grande itself since in the early eighties. In this connection, said witness is asked to state when he last observed flood waters while on the navigable part of the Rio Grande which from its color he judged to come from the Upper Rio Grande.

A. As this interrogatory is not directed to me, I have no answer to make thereto.

71. Q. If it is true that witness Kelley has not observed any flood waters on the navigable portion of the Rio Grande which from their color he judged to come from the Upper Rio Grande, then is it not true, according to his observation, that the flood waters of the Rio Grande have not contributed materially to the navigation of that stream since in the early eighties?

A. As this interrogatory is not propounded to me, I have not the knowledge sufficient to answer the same, therefore not knowing of the matters inquired about in this last cross-interrogatory.

319 72. Q. For how long a period during each year, and at what time of the year, is the amount of the water in the Rio Grande, in its navigable parts, substantially increased by flood flows coming in from its tributaries?

A. I know nothing of the matters contained in this interrogatory.

73. Q. During such period to what extent is that navigable depth of the Rio Grande increased, and how much is such stream widened?

A. I know nothing of the matters contained in this interrogatory.

74. Q. When such floods come, are the waters confined within the banks, or do such floods rise over the banks of the Rio Grande and deposit waters in lagoons, lakes, and depressions?

A. The floods cause the overflow of the waters of the Rio Grande, and this water is then deposited in lakes, lagoons, and other depressions.

75. Q. What portion of any particular flood which may in a week or ten days pass Ringgold Barracks will reach Brownsville? Does the amount of water which will reach Brownsville from such flood lasting, say, a week at the head of navigation constantly decrease as it comes down the channel and deposit itself in such bayous and lakes, or is it absorbed by the sand?

A. I know nothing of the matters contained in this interrogatory.

76. Q. Have you any knowledge or information as to how far below El Paso water will run in the channel of the river before it is
320 absorbed and taken up by the sand, when for five days or ten days or thirty days, at El Paso, such water ran one foot deep and fifty feet wide, or when it ran at any other particular depth or width for any given period of time at El Paso?

A. I know nothing of the matters inquired about in this cross-interrogatory.

77. Q. Do you know what would be the effect of a flood at El Paso, Texas, which ran a thousand cubic feet per second, for one day, or ten days, or twenty days, or thirty days, so far as increasing the depth and velocity of water in the river at Fort Quitman, Presidio del Norte, or the mouth of the Pecos, or Eagle Pass, or Rio Grande City, or Brownsville is concerned?

A. I know nothing of the matters inquired about in this interrogatory.

78. Q. Do you know how much the river would be raised at Rio Grande City by a flood passing El Paso, Texas, amounting to 15,000 cubic feet of water per second, and running for ten days at that rate?

A. I know nothing of the matters contained in this interrogatory.

79. Q. Do you know in the month of May, 1897, whether any flood entered the Rio Grande from either the San Juan, Salado, San Antonio, the San Rodriguez, Santiago, San Philipe, Devil's River, Pecos, or the Concho? If you , which one of these streams do you know of any flood entering the Rio Grande from during that month?

A. I can not recollect any of the matters inquired about in this interrogatory.

80. Q. Have you any knowledge as to whether any flood came
321 from either one of those tributaries into the Rio Grande during that month? Please state which one of them you do not know with reference to.

A. I wasn't here and could not tell whether or not a flood really took place.

81. Q. Do you know whether there was a flood from either one of those streams entering into the Rio Grande during the present calendar year? If so, which one of them had a flood and what month did the same occur in? If you do not know with reference to any one of the same during the present year, please state which one you do not know with reference to.

A. I know nothing of the matters inquired about in this cross-interrogatory.

82. Q. In interrogatory seven you are asked to state your full knowledge of the effect of the ordinary flow of water and of the flood waters which come from above El Paso. As a matter of fact, have you had any personal observation which will enable you to state just what regular flow or flood flow comes from El Paso or above there, or are you simply depending upon hearsay as to that?

A. I know nothing of the matters asked about in this cross-interrogatory.

83. Q. Do you know anything about the amount of waters which have flowed regularly by El Paso since 1880 or previous thereto?

A. I know nothing of the matters asked about in this cross-interrogatory.

84. Q. What was the width and the depth of the water flowing in the Rio Grande passed El Paso in 1880? What was it in 1885? What was it in 1890? What was it in 1895? What was it in 1899?

322 A. I know nothing of the matters contained in this last cross-interrogatory.

85. Q. Do you know during what years between those dates or previous to those dates the river has been absolutely dry at El Paso for any considerable number of months in the year; and if so, what months?

A. I know nothing of the matters inquired about in this cross-interrogatory.

86. Q. Do you know what flood flows passed El Paso in the years above named? Do you know how long the flood of 1897 at El Paso lasted?

A. I know no knowledge of the matters inquired about in this cross-interrogatory.

87. Q. If you have testified as to any flood flows passing by El Paso during any of these years, state whether you were at El Paso and saw them or whether you were simply guessing that they passed El Paso because you saw them at some point further down the river.

A. As I did not testify as to my observing any floods passing by El Paso, I can not answer this question.

88. Q. If you saw any floods down the river at any navigable part thereof during any of these years, is it not possible that they may have come from some of the tributaries of the Rio Grande above named?

A. I know nothing of the matters inquired about in this interrogatory.

89. Q. Is it not possible that such floods may have come from heavy rains along the Rio Grande below El Paso?

323 A. I know nothing of the matters inquired about in this last cross-interrogatory.

90. Q. How far above El Paso were you ever? Did you ever come up the Rio Grande from the head of navigation to El Paso overland and observe the flow of the Rio Grande along its entire course?

A. I have never been above El Paso. I never came up the Rio Grande from the head of navigation overland to El Paso, nor have I observed the flow of the Rio Grande along its entire course.

91. Q. If, in answer to interrogatory eight, you state that you have personally observed the bed of the said Rio Grande as to hollows or depressions, and that the same is porous and capable of large absorption, or that the same has sloughs or bayous and arroyos which have a natural tendency to detract from its navigable capacity during a low stage of water, and which have to be filled before the river can be raised by floods and increased flows, please state what ultimately becomes of the water which is consumed by such porous character of soil or which runs into such sloughs or bayous or arroyos.

A. I have stated in the eighth answer to the direct interrogatory that there are hollows and depressions in the bed of the river; but as to whether the water is absorbed by the pores in the rock, I have no idea. I do not think so. I have no knowledge of what ultimately becomes of the water.

92. Q. Does this water stand in such sloughs and bayous until it is absorbed by the soil or by evaporation?

A. I know nothing of these inquiries as to whether the water in these lagoons and bayous are absorbed by the soil or by evaporation. I said depressions and hollows.

324 93. Q. If you state that you have observed such sloughs and bayous, state how far up the river you have observed the same, and whether practically the same condition does not continue up the stream to El Paso and north of that place.

A. I know nothing of the matters inquired about in this cross-interrogatory.

94. Q. If you state that such sloughs and bayous check and hold this water and such waters sink into the sand and are absorbed, please state if these facts would not tend to constantly decrease any floods which might pass El Paso and so decrease the same as to practically consume it, so that it would not substantially aid navigation where said river is navigable?

A. I know no knowledge of the matters inquired about in this last cross-interrogatory.

95. Q. If, in answer to interrogatory eight, you state that the flood waters of the river are necessary to fill bayous and depressions, in order to keep the regular current flowing down, then please state whether, in your opinion, that result is the greatest good produced by these floods? As matter of fact, the floods are treacherous, are they not?

A. I know nothing of the matters inquired about in this cross-interrogatory.

96. Q. Are you acquainted with the steamer "Bessie;" and if so, what relation towards it do any of you bear? Can the steamer "Bessie" come up the Rio Grande against the flood coming down the stream with any considerable force?

A. I know nothing of the steamer "Bessie."

97. Q. It is a fact, is it not, that it is exceedingly trying and dangerous to the safety of the vessel and the progress of the same to undertake to navigate the river depending upon the flood flow?

A. I know nothing of the matters contained in the last cross-interrogatory.

98. Q. It is true, is it not, that if the steamer comes up the Rio Grande during a flood it is exceedingly liable to be stranded by reason of the subsidence of the flood before the steamer reaches its destination?

A. I know nothing of the matters contained in this last cross-interrogatory.

99. Q. Can the steamer "Bessie" come up the Rio Grande at all during the heaviest flood flows which occur along its navigable course? Is it not true that she can better navigate when the floods are not greatest, and that if the excessive floods were lessened she would make quicker and safer trips?

A. I know nothing of these matters.

100. Q. How many irrigating ditches do you know of from the vicinity of El Paso to Brownsville, Texas? If any, where are the same located and how much of the Rio Grande do they divert, and on which of the river are they—on the American or Mexican side?

A. I know nothing of the matters inquired in this 100th cross-interrogatory.

101. Q. In direct interrogatory tenth you are asked what would be the effect of storing water 125 miles above El Paso, Texas, so far as the navigability of said river is concerned. Do you know a point named as Elephant Butte, about 125 miles above El Paso, Texas? Were you ever at such point? Do you know whether the bed of the proposed reservoir at Elephant Butte is sandy, or whether the river at that point flows through a rocky cañon? When were you there?

A. I know nothing of the matters asked about in this cross-interrogatory.

102. Q. Do you know the character of the bed of such stream below Elephant Butte down to a point of rocks just above Las Cruces, New Mexico? What is the character of the bed of such stream at such point?

A. I know nothing of the matters asked about in this last cross-interrogatory.

103. Q. Have you ever been connected with an irrigation company, or had any experience in the use of waters of reservoirs? If so, where, and what experience have you had? How large was the reservoir with which you had such experience.

A. I have been connected with an irrigation company, but have never had any experience in the use of water from reservoirs.

327 104. Q. Do you know what per cent of the waters which would be impounded by a dam thrown across the river 125 miles above El Paso, Texas, would pass off by evaporation?

A. I know nothing of the matters inquired about in this cross-interrogatory.

105. Q. Suppose such dam held water fifty feet deep, ten miles long, and a mile wide; what amount, in depth, of such water, in such place, would pass off by evaporation, and how do you know that?

A. I know nothing of the matters inquired about.

106. Q. Do you know how much such water, when being let out of such dam and used in the neighborhood thereof for irrigation without being taken out of the valley of the Rio Grande, would return to the Rio Grande and contribute to its flow? If so, what per cent would so return; what would become of the balance of the water? What part would pass off in *vagatation*? What per cent of what is lost would be due to absorption?

A. I know nothing of the matters inquired about.

107. Q. What would be the effect upon the flow of the river at its navigable parts if the water of the stream so impounded at this point, 125 miles above El Paso, and used, as is asked in direct interrogatory tenth, for manufacturing purposes, and let back into the river into such quantities as would be sufficient to supply all ordinary manufacturing purposes which might be located thereunder?

A. I know nothing of the matters inquired about.

328 108. Q. As matter of fact have you sufficient technical knowledge to be certain what the effect of *empounding* the waters of the Rio Grande 125 miles above El Paso and using them along the banks of the stream for irrigation would have upon the flow? Do you not know it to be a fact that such acts would tend to equalize the average flow of such river?

A. I know nothing of the matters inquired about.

109. Q. If 500 cubic feet of water per second were taken out of a reservoir constructed 125 miles above El Paso, how much of it would reach El Paso and how much of it would be lost in the bed of the river itself by absorption and evaporation?

A. I know nothing of the matters inquired about.

110. Q. If five hundred feet of water reached El Paso, Texas, traveling down the bed of the stream after having been turned out of the reservoir 125 miles above El Paso, how much of it would be diverted out of the stream by the Juarez dam at El Paso and flow off down the Juarez Canal on the Mexican side, and how much of it would be diverted by the El Paso wing dam and flow down to El Paso?

A. I know nothing of the matters contained in this last cross-interrogatory.

111. Q. If you have stated that the flood of waters of the upper Rio Grande ever reached the lower portion of the river, please state at what season of the year the floods usually come down the river.

A. I know nothing of these matters, as I have not stated that the flood waters of the Rio Grande ever reached the lower portion of the river.

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112. Q. If any of the floods waters from El Paso or above ever come down the Rio Grande, and you have undertaken to state that there are any sloughs, bayous, or arroyos in the bed of the stream which such flood waters might fill up or that such flood waters do actually fill up the same, please state when the flood waters fill the same, and how long the waters remain therein. State if it is not a fact that even if enough flood waters come down to fill the sloughs, bayous, and depressions in the bed of the Rio Grande that such flood waters would and do evaporate or disappear before the perennial flow of the Rio Grande comes down the same.

A. I know nothing of these matters.

113. Q. Have not the floods of the Rio Grande at Presidio, Rio Grande City, Laredo, Eagle Pass, and Brownsville been greater during the present year than they have been for many years previous? If you answer that they have not, please state during what years within the past ten years, and during what month in such years, there have been heavier floods than during the present year. In your answer name each year during the last ten years, and the month or months of each year during which the floods have been greater than they have during the present year at the points mentioned. And state, if you know, *that* the highest water reached by the river at each of such points during the present year and the time of such high water and the highest water at each of said points during the past ten years.

A. I do not know this, as I was not here, and do not know anything of the floods in the Rio Grande during the present year.

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114. Q. With whom have you conversed about giving testimony in this case? Were you asked to come in person at the trial of this case and give your personal evidence by anyone, and if so, whom? When did you first see or have read to you the interrogatories and cross-interrogatories which have been propounded to you, and who first showed them to you and told you of the same?

A. In regard to the giving of the testimony in this case I have conversed with W. P. Sutton. I was not asked to give evidence at the trial of this case by any one. I have never seen the interrogatories nor never heard them until I came before the commissioner who read them to me to be answered.

115. Q. Have you read over such interrogatories or cross-interrogatories with any one previous to having the same propounded to you by the officer taking your deposition? If so, with whom did you read over the same?

A. I have never read over the interrogatories or cross-interrogatories with any one previous to the same being propounded to me by the officer taking my depositions.

116. Q. Has any one written out for you or furnished you with a written answer or suggested a written answer which would be suitable to any of the interrogatories or cross-interrogatories which have been submitted to you? If so, who has done so?

A. No one has written out for me or suggested to me answers suitable to the interrogatories propounded.

117. Q. Has any one suggested any portion of the answers or any portion of an answer to this interrogatories? If so, whom?

A. I answer the same as on the above; no.

331 118. Q. Do you speak English or have the questions been translated to you? If so, have your replies thereto been translated into English before being written down?

A. I speak English. The questions have not been translated to me.

119. Q. In whose presence and where and on what day have you given this answers? Name every one who has been present while you were giving this testimony, listening to the same. Has any attorney been present? If so, give his name and state whether he was the attorney for plaintiff or for the defendant.

A. There were no one present when I answered these interrogatories except the United States commissioner, the stenographer, and myself, and nobody has listened to the testimony. This depositions were taken in the court-house, in Eagle Pass, Maverick County, Texas, on the 2nd day of December, 1899.

120. Q. Has anyone representing the United States Government or pretending to so represent it been present at the taking of this testimony? If so, state his name.

A. No one representing the United States Government or pretending to represent the United States Government has been present at the taking of my depositions.

(Signed) WILLIAM SCHUCHARDT.

332 ALBERT THORNHAM, a witness on behalf of the Government, having been duly sworn to testify the truth, etc., and being examined on direct-examination by Judge M. C. Burch, testified as follows:

Direct-examination.

Questioned by Judge BURCH. Where do you reside, Mr. Thornham?

A. Brownsville, Texas.

Q. How long you resided there?

A. I was born there.

Q. Have you resided there ever since?

A. Ever since; yes, sir.

Q. How old are you?

A. 32.

Q. What is your occupation or business?

A. At present I am employed in the customs service, as special deputy collector for that district—district of Brownsville.

Q. United States customs service, I presume?

A. Yes, sir.

Q. I suppose, of course, you are acquainted with the Rio Grande?

A. Yes, sir; I was employed on the river for about seven years.

Q. You speak of "on the river"—

A. Yes, sir; in the steamboat business.

Q. What capacity?

A. I was clerk and manager, and representative of the owner, on the boat.

Q. Who was the owner?

A. William Kelly.

Q. What steamer?

A. "Lulu D." was my first steamer, and after that the "Bessie."

Q. "Lulu D.?"

A. Yes, sir; the "Lulu D."

Q. Beginning with your first acquaintance with the steamer—

333 A. What—when I first commenced on the steamer?

Q. Your first personal acquaintance as a boy.

A. As a child, I remember—very young; when I was very young I remember many boats that were on the river.

Q. Can you give the names of any of them?

A. My first recollection of steamboating was the steamer "Leo." It was the largest boat that I ever knew of.

Q. Who were they bought from in that early day?

A. Prior to Mr. Kelly's connection with it, it was Jeremiah Galvan; he was the owner of the steamboat.

Q. What about King, Kennedy & Company?

A. My acquaintance with King, Kennedy & Company is simply through their records.

Q. Before your time?

A. Yes, sir; that was before my time; have no distinct recollection of that.

Q. How continuous has been navigation from your earliest recollection?

A. Well, it has been carried on as far back as I can remember.

Q. And down to when, present date?

A. Up to the present date.

Q. You bear any relations to Mr. William Kelly, the owner of the "Bessie?"

A. He is my stepfather.

Q. And you say you was in his employ?

A. Yes, sir.

Q. Now, when did your actual navigation of the river begin—what years?

A. In 1884—in 1883 or 1884. Either latter end of 1883 or first of 1884.

Q. Had you made trips up or down the river before that?

334 A. Yes, sir; when I was younger—went up and down to the mouth of the river frequently; always spent the summer at the mouth of the Rio Grande, and always went up and down by boat.

Q. How about the upper river, up above Brownsville—before you commenced navigation, I mean—did you ever go up?

A. Yes, sir; I went there once or twice.

Q. How far up?

A. Probably three times, as far as Roma.

Q. How far is Roma above Rio Grande City, by river?

A. Well, it is by law—it is about seventeen miles, and twice that distance by river.

Q. The boat in later years has actually navigated above Rio Grande City?

A. No, sir.

Q. Now, bringing your observation of this navigation down to the present date, this summer?

A. Yes, sir.

Q. You say you began in 1884 actual navigation—

A. Yes, sir.

Q. Of the stream; was that above or below Brownsville?

A. That was from Brownsville to Rio Grande City, Camargo, and Roma, on the steamboat "Bessie."

Q. Then you actually navigated as high up as Roma, did you?

A. Yes, sir.

Q. What other boats were running at the same time, if any?

A. Since my actual connection with the river there has been no other boat. I was working in Mr. Kelly's office when he bought the steamboat "Lulu D." She was brought out there to run opposition to his boat, the "Andrew Ackley," and he bought this fellow out that owned the boat—acquired her. The "Ackley" was very old, and he stopped the use of her and took up his business with the steamboat "Lulu D." I was sent up one or two trips on the "Lulu D." to become acquainted with the business, and when he brought the "Bessie" out I was placed practically in charge of her.

Q. You say "when these boats were brought out." What do you mean by that? Where did they come from?

A. The "Bessie" came from St. Louis; the "Lulu D." came from New Orleans.

Q. Came in over the bar?

A. Yes, sir.

Q. Up the river to Brownsville?

A. Yes, sir; came up the river.

Q. And then navigated from there above?

A. From there above.

Q. So far as your knowledge is concerned, has that been the usual case of bringing boats in instead of building them there?

A. I don't think there was ever a boat built in Brownsville or vicinity. They were built in the North.

Q. And brought down the river?

A. Brought through the Gulf coast to the mouth of the Rio Grande, and they continued from there up to Brownsville.

Q. And that was the case of the present steamer, the "Bessie?"

A. Yes, sir.

Q. What burden is she, do you know?

A. She registers 99⁵⁹/₁₀₀ tons.

Q. What was the "Lulu D.?"

A. 200 and more tons.

Q. What is the draught of each of them—at light and heavy?

A. The "Bessie," light, draws about twenty inches, and loaded drew three and a half feet.

Q. Can you give the name and tonnage of any of the other boats within your personal recollection?

A. My knowledge of the most of the other boats has been acquired since, that is, as to tonnage, etc.—acquired since leaving the river through the records of the customs service.

Q. Then you don't know personally?

A. No, sir; not of my own knowledge.

Q. Well, I was asking you—I asked you what the draught of the "Bessie" was, light, and what did you give it—what it was when heavy and when empty?

A. Yes, sir.

Q. And the "Lulu D.?"

A. The "Lulu D." was a much larger boat, and her draught was two and a half feet, and when loaded she drew four and a half feet.

Q. How long did the "Lulu D." ply up and down there, within your observation?

A. She was there about two or three years.

Q. Have you ever had personal observation of boats on rivers—that is, other rivers? Ever known such rivers as the Mississippi, Ohio, or any of those rivers?

A. I made one or two trips, just for pleasure, on a portion of the Mississippi and Red River. Went down the Red River from Fulton, Ark., to New Orleans.

Q. What sort of resemblance does the steamer "Bessie" and the "Lulu D." bear to the line or river boats plying on those rivers? Same class of boats?

A. Yes, sir; just like other steamboats.

Q. Stern wheels?

A. The "Lulu D." was a side-wheeler.

Q. And the "Bessie?"

A. She is a stern-wheeler.

Q. Just like the ordinary run of river boats on other rivers of the country?

A. Yes, sir; the "Lulu D.," for instance, was built for running on the Mississippi and Red rivers.

337 Q. And the "Bessie?"

A. The "Bessie" was built at St. Louis for navigation on some of the rivers there.

Q. Well, now, during the time you was on the "Lulu D." and the "Bessie" did you know of their business affairs?

A. Yes, sir; I had knowledge of the business management.

Q. You was clerk, and sort of practically the manager.

A. Clerk, and connected with the office.

Q. Well, now, can you tell me about how many trips a year they were accustomed to make between Brownsville and Rio Grande City, or different points—the highest ever touched above Rio Grande City?

A. The "Bessie," from 1884 to 1887, averaged about three trips a month—that is, ten days for trip.

Q. From 1884 to 1887?

A. Yes, sir.

Q. And later?

A. And later it averaged two and a half trips a month.

Q. Was there some diminution—what was the occasion, diminution in the freight business or capacity of the stream?

A. Diminution in the freight business, brought about by railroads coming into the country and taking out trade from the lower section of the country.

Q. When you speak of this you mean at Eagle Pass and Laredo?

A. Yes, sir; Eagle Pass.

Q. Did the railroad on the Mexican side have any effect?

A. No, sir; that practically didn't compete with our boat at all.

Q. Explain why.

A. Well, a railroad on the Mexican side of the river couldn't possibly carry any American freights.

Q. On account of the customs?

A. Yes, sir; people couldn't take freight from the American side and transport it on the railroad, and then reimport it into the United States without the expence being so much as to make it impracticable.

338 Q. They had no arrangements for taking it in bond?

A. No, sir; that was impracticable.

Q. Then that cut no figure, then, you say?

A. No, sir; practically cut no figure.

Q. Were there any Mexican boats within your recollection?

A. Not within my recollection.

Q. Did you say there was a diminution of freight business above Rio Grande City by reason of the railroads coming through Laredo and Eagle Pass?

A. Yes, sir.

Q. State whether or not it is a profitable business, the running of this boat during those years.

A. Yes, sir; it paid; it paid to run them always.

Q. Been a financial success down to what time, if you know?

A. Up to the present year.

Q. You have had personal charge of these matters, have you?

A. Yes, sir; I have been posted as to the net receipts of the trip.

Q. Now, getting right down to 1877—May, 1877—when this suit—May, 1897—when this suit was begun, were there any trips made in 1897?

A. Yes, sir.

Q. How many?

A. Well, I can't state the exact number, but there were probably between twenty and twenty-five, as near as I would be able to judge.

Q. Was there any in 1898?

A. Yes, sir; the boat ran in 1898.

Q. Steadily?

A. That is, as steadily as might be with the conditions; as steadily as was practicable with the amount of flood and the condition of the river.

Q. State how many trips were made during that year.

A. Oh, probably between eighteen and twenty; somewhere around there.

339 Q. What is true of the present year—1899, summer of '99?

A. Probably made 8 or nine trips this year.

Q. What is the reason why she has made less trips this year than in 1897 or 1898?

A. Well, the freight offered; there had been very little freight offered, and the river has been pretty dead for the greater portion of the time.

Q. Did the amount of freight offered have any bearing upon the—have any relation to the condition of the river? In other words, whether the people made arrangements on account of the lowness of the river, or anything of that kind?

A. No, sir; we could get them—could get a fair portion of the freight steadily, if the river were in first-class condition and they could make trips.

Q. In other words, the boat could run regularly, and people could depend upon it, they would still have plenty of business?

A. Yes, sir.

Q. That is, during the present season?

A. Yes, sir.

Q. How recently has she made a trip—the "Bessie?"

A. I think her last trip was made about three months ago, sir.

Q. Have you ever had any observation of the diminution of this stream—that is, the decreased capacity for navigability—have you observed it?

A. Yes; I noticed it from the time I first went on the river until I left there; I noticed it, that the river got worse all the time.

Q. You mean in 1884, when you say you first went on?

A. Yes, sir.

Q. From 1884 down to the present time it steadily got worse?

A. Yes, sir.

Q. I want to call your attention to the present season; now do not forget it. There was a flood in the present season around there?

340 A. Yes, sir; the river was very high in October.

Q. Very great flood?

A. Yes, sir; good flood.

Q. Unusual?

A. Quite unusual for that time of the year.

Q. Know where it came from?

A. No, sir; have no idea.

Q. You have heard?

A. The general reason given for this flood was the heavy rains reported all over the country.

Q. Did you have reports from where this rain came from that made this flood?

A. No, sir; only occasional reports.

Q. Which was the greater one, the June flood or October flood; this year, I mean?

A. I think in October the river was highest.

Q. Well, you knew, in a general way, of great rains, didn't you, through Texas—southern Texas?

A. Yes, sir; the newspapers reported heavy rains all over the country tributary to it.

Q. Can you state when they reported about this particular flood?

Mr. HAWKINS. That is not testimony.

Judge BURCH. I only wanted to connect the reports of the newspapers with the river itself.

The COURT. Proceed.

Q. Now, going back to the diminution in navigation of the stream, and decrease of navigation, just state fully to the court what you have observed in regard to it, in your own language. Begin with 1884, when your first experience—I mean your first actual navigation began, and running down.

A. Well, when I first went on the river, as I said before, we averaged about three trips per month, and did a good trade and had
341 very little trouble with the river; when I say trouble I mean running around and having to haul over sand bars. We continued that for about two or three years; did very well. Kept up our

average of about three trips a month, and after that, while the river was high and had plenty of water in it, we had no trouble, but we found that the river dropped down again, there was practically no channel left. The flood came so often, and run through so quickly that they didn't make a channel in the river, and it impeded navigation to a great extent, that we have, for instance, to start out and pull the boat over sand bars. I have started out and had to pull the boat across a sand bar about two or three miles above town.

Q. Above Brownsville?

A. Yes, sir; and then we would have trouble of that kind, and probably run a whole day and have no trouble at all, and then the next day it would have the captain laying lines all day.

Q. What was the best stage of navigation? What did you consider the best stage of navigation as to water for navigation?

A. In my opinion, the best stage for a boat like the "Bessie," is a de'd low water; that is, after the water has been high, and falls gradually the current marks out a channel, and during the low stage it is usual to follow the channel, and when the current has been swift for ten or twelve days, it leaves the marked channel, and there is less current in the year, and it is easier to navigate it with a light-draught boat.

Q. About what depth would that be?

A. At the crossings, three and a half feet is a good depth.

Q. And what at the bends; what would that be, generally, in the bends?

A. In our soundings we used a six-foot pole and when the men run his sounding pole below five and a half feet, he called "No bottom."

Q. Now, explain to the court what crossing and bends mean. I see those terms are used in the depositions. What are crossings and what are *are* bends? What is the difference between bends and crossings?

342 A. We call the crossing at the point where the sand bar—in the lower country the soil is always loosening—and it is generally where the channel changes from one side of the river to the other; that is, the current comes down and points into the bend and shoots across the river, and a crossing is at that point where the current leaves the bend to start down into the next bend; that is, to start down the reach into the next bend, the crossing of the current from one side of the river bed, and the bend is between the two.

Q. Then the crossings are the stretches that occur between the bends?

A. Yes, sir.

Q. Then you expect around the bends *dipper* water than you had in what you termed crossing or stretches?

A. Yes, sir.

Q. Have you ever had any financial interest in the business, or this steamboat navigation, other than your salary as an employee?

A. No, sir; I was always paid a salary. I had a financial interest to this extent—we are all in the same family. Mr. Kelly is my stepfather, and I had an interest to the extent that I always wanted to see him prosper, because it necessarily followed that I was prospering with him.

Q. Now, since you left the employee of the company and went into other business, do you in your attention to your duties as deputy collector have any duties to perform with him?

A. No, sir. I have had no particular business connection with him since I have been in the customs service except to go around to his office and do a little work for him, posting the books or something of that kind; not doing it for a salary, just simply because of our relations; he is practically my father.

Q. Now, did you ever have any observation, or did you ever make any observation while you were running this boat, of the stream in connection with reports received from known sources up the river; for instance, from El Paso, or from other places up the river, of floods or rises?

A. When I was running on the river we always kept posted from the main office. He would wire us when he got the despatch at Rio Grande on any reports of rises in the river.

Q. When were they coming?

A. Well, yes; he would usually say from where they were. He had a system of postal cards and he had some correspondents advise him by wiring any rises on the river or sending him these cards.

Q. Did you have any observation in that respect or reports concerning the main river above El Paso?

A. No, sir.

Q. Not above El Paso?

A. I think they had a correspondent at El Paso.

Q. Do you know of that?

A. No, sir; I am not absolutely certain whether it was El Paso.

Q. Did you ever yourself observe the occasional reports of rises of the river?

A. No, sir; I did not.

Q. Were you able to distinguish from what source, or suppose you were able to distinguish from what source, waters came on these rises?

A. No, sir; I couldn't distinguish them; that is, I couldn't look at the water and say it came from such a place. I have heard the old shillbacks telling about the water being such and such a color coming from one place, and so on, but I can't say from my own observation.

Q. Now, you say that the best stage of navigation would be from three to six feet, do you?

A. Yes, sir.

Q. And that would be the most practicable and desirable stage within your experience?

A. Yes, sir.

344 Q. One more question. Suppose that there was, as formerly—suppose there was now as formerly a reasonable stage of water from three to eight—six to eight—feet in the river from that portion of the year, say, during which it formerly obtained when you first went on the river, and it was known that regular trips now, as then, could be made; in your opinion would there be an increased amount of freightage?

A. Yes, sir.

Q. Based on the river?

A. Yes, sir.

Q. Now, that would give an opportunity for increased tonnage upon the river, and revive things, etc., would it not?

A. Yes, sir.

Q. Now, I would like to ask you whether there is not a railroad or practical method, except it be teaming, or ox cars, as it is termed, for freighting from Brownsville to upriver points, as far as Rio Grande City—any other practical method?

A. The only practical method of freighting is by teams, either mule or ox teams.

Q. How long a distance?

A. It is about 110 miles from Brownsville to Rio Grande City.

Q. How many towns are there on the road—counties?

A. The road runs through three counties.

Q. Name them.

A. Cameron, Hidalgo, and Starr.

Q. Through what towns?

A. There is Santa Maria in Cameron County; Edinburg, Pitas, and Havana in Hidalgo County, and Rio Grande City in Starr County.

Q. Something has been said about drouths in that section of the country since 1886. How far back does your memory extend as to whether—I mean as to dryness or wetness of season?

A. I have no accurate knowledge.

345 Q. Have no accurate knowledge of data; but how far back does your recollection extend? You say you are thirty-four.

A. Thirty-two. Well, there has been an extended drouth down there for some time; but as to comparing that period with some previous period there, I wouldn't undertake to do it.

Q. What do you mean by extended drouth?

A. Over three or four successive years.

Q. In that region?

A. In that region; yes, sir.

Q. Did it occur about that time? Were there extended periods of drouth before that time, within your recollection?

A. I have no recollection of it.

Q. Have conditions changed, as to stock raising, or anything of that kind?

A. During this period that I said, there were losses through death of cattle supposed to have been caused from the drouth. There was a dearth of pasturage and supply of water that caused the death of great many cattle down in that section. Where they ever had such a period as that before or not, I could not say.

Q. You have no recollection of hearing of any?

A. Well, I have heard people talk of previous drouths, but I have no recollection of it. Probably there was one during my lifetime, probably two, but I was not old enough to appreciate the conditions there.

Cross-examination. Examined by Mr. HAWKINS:

Q. When did you say you first commenced to navigate the river on the boat "Lulo D.?"

A. About—I think it was the latter part of 1883 or the first of 1884.

Q. What boat was that.

346 A. I think that was the "Lulu D." I made my first trip on.

Q. And between what places did she ply?

A. I think, on the trips I went upon her, she went as far as Rio Grande City.

Q. Are you sure of that?

A. Yes, sir; I am certain of that.

Q. That is in 1883 and 1884?

A. Well, I am not absolutely certain as to that date. I went on the "Lulu D." previous—made a trip on her previous to working myself. I was sent up there preliminary to being put in the business. The actual date of that trip I wouldn't be positive.

Q. Might it have been in 1881 or 1882?

A. Not absolutely certain; I remember I made this trip on the "Lulu D." before my actual commencement to work on the river.

Q. Now what time did your actual connection commence?

A. I think it was in 1884; somewhere along there.

Q. Think it was in 1884?

A. Yes, sir.

Q. At the time you commenced to navigate the river what points did the boats make upstream from Brownsville?

A. At the time I went on to work on the river?

Q. Yes, sir.

A. The first trip that I ever made was from Brownsville—steamed all the way—went to Rio Grande City, Roma, and Comargo.

Q. How far is Comargo from Rio Grande City?

A. It is about six miles.

Q. Six miles on what river?

A. On the San Juan River.

Q. On the San Juan?

A. Yes, sir.

Q. Can the boats go to Comargo now?

A. No boat has been to Comargo for a long time.

347 Q. Why don't they go there?

A. Well, never any freight for there now. Comargo, the town of Comargo, has gone down a great deal, and they do very little business there now.

Q. Can the boats go to Comargo now, if they had the freight?

A. Yes, sir; I think they could; with difficulty, of course. They would have to go over all that river now. If they had a good stage of water, they could go to Comargo now.

Q. How often did they formerly go into Comargo?

A. Well, before my time, I think they ran there regularly. I probably have made, altogether, eight or ten trips on the "Bessie" to Comargo.

Q. You have been in there yourself?

A. Yes, sir; I have been there myself.

Q. They formerly, according to your knowledge, ran there regularly. What do you mean by regularly?

A. Well, I don't mean by regularly—I don't mean that they ran there on the schedule; that is to say, that they reached there Thursday of each week or the 10th of each month—anything of that kind; but it was very common thing for the boat to go on up, on their trip, and clear from the port of Rio Grande City to the port of Comargo, and then on the return take freight at Rio Grande City, and then on down the river.

Q. Did she go up there to Comargo with the same ease that she went on up to Rio Grande City?

A. Well, Camargo is beyond Rio Grande City.

Q. Well, did they go to Camargo with the same ease that she went to Rio Grande City?

A. Your question is not intelligible to me, just in that way.

Q. I mean, when she left the Rio Grande did she have any more difficulty in navigating on the San Juan up to Comargo than she did in navigating up to Rio Grande?

A. I will answer that question in my own way. The stage of river from Camargo to the mouth of the San Juan is the nicest piece of
348 river I ever saw. It is narrow and deep water—on the times that I have been up there; the river is narrow and the water is deep and there is very little current in it, and we run that six miles in the "Bessie" faster than any stage of river I ever saw.

Q. Well, now, can you do that now, to Camargo, on the San Juan?

A. Yes, sir; I think so, unless there has been some very great change since I was there.

Q. Didn't you say a while ago that it was very difficult to get up there now?

A. Oh, no; not the San Juan. I haven't been on the San Juan for a long time. All the lower river is becoming more difficult to navigate, but there are no crossings or reaches in the San Juan at all. It is straight.

Q. Do you mean to say that there is as much water in the San Juan now, down between Camargo and the Rio Grande, as there was in former days?

A. I can't say.

Q. Don't know as to that?

A. No, sir.

Q. What did you say was the extent of the navigation when you commenced running first on the Rio Grande; were there more than two boats in competition with each other?

A. Yes, sir; within my recollection there has been more than two.

A. My recollection of competition was—competition was between the "Andrew Ackley," which was owned by William Kelley, and the steamboat "Lulu D.," owned by—represented by Capt. Randle, from Mobile. He came out there and ran opposition to Mr. Kelly.

Q. And Capt. Kelly bought her off—bought her out, in order to prevent competition?

A. Bought his boat; yes, sir. I judge that was the object.

Q. Now, in what year was that?

349 A. I am not certain as to the year.

Q. About when?

A. I couldn't say what year he bought the boat. I know that I was not working. I was a boy going to school at the time.

Q. Well, after you commenced running on the "Lulu D.," how frequently did you say you made trips, or that boat made trips on the river?

A. On the "Lulu D." I have made one or two trips; I told you about that. I was not actually working on the "Lulu D."

Q. I don't mean the "Lulu D.," I mean the "Bessie."

A. For a long period, after first going on the "Bessie," I averaged about three trips a month, averaged three trips a month.

Q. All the year round?

A. Well, yes, sir; pretty much all the year round.

Q. Between what points?

A. We didn't always get to Roma. Went to Roma when freight offered for Roma.

Q. About three trips a month?

A. Yes, sir.

Q. Was your boat constantly employed in making these three trips a month, or did it tie up for a week or ten days at a place?

A. No, sir; when we were going at that rate didn't tie up for any length of time, just time enough to unload or load the boat, and frequently had to run at night—run extra gangs at night.

Q. How long in those days did it take you to make your trip from Brownsville up to Roma?

A. Well, we considered a good trip—round trip, ten days?

Q. Ten days?

A. Yes, sir.

Q. And that was in 1883 or 1884, was that?

A. Yes, sir? along in the 80's—1884.

Q. How long did you continue to make trips that frequently?

350 A. Well, I don't know as I could answer that question accurately.

Q. Well, just a general—

A. Run along that way for about four years; continued to be considerable business; good.

Q. About four years?

A. Yes, sir.

Q. That would bring it up to about 1888?

A. To 1888 or 1889, somewheres along there.

Q. Might have been a year later?

A. Yes, sir.

Q. Well, now, during that period from 1883 or 1884 to 1888 or 1889, when the "Bessie" was making these three trips a month regularly all the year around, did you find any variation in the different seasons of the year as to the depth of water in the river's channels at the particular places she travelled over?

A. The channel of the Rio Grande has never been fixed; it is always changing from one place to another.

Q. How often would it?

A. Well, the water would change every time there was a rising; channel would change every time there was a rise.

Q. Usually when you went up on a trip you had no assurance that you would come back over the same ground?

A. No, sir.

Judge BURCH. You mean the entire channel changed?

A. Changed at different points.

Q. How violent were these changes—over what surface might they extend—at one flood, what length?

A. Don't exactly understand that question.

Q. How extensive was it usual for changes to be made by one flood along that course below Rio Grande in those days?

A. The question is still not plain. Do you wish to know what territory was covered by a single change, by one change; is that the idea?

351 Q. Yes, sir; that is the idea.

A. I have seen the crossings in one reach change all the—three or four crossings change in one trip—that is, in four or five days.

Q. So that the river would be away some distance from its old channel?

A. Yes, sir.

Q. How far have you known it to change away from its old channel in one rise?

A. Where it still remained to its bed, or do you mean cut-off?

Q. Cut-off; any change which it made.

A. I have frequently—that is, several times—come across a cut-off—that is, where the water broke through the bed, instead of going all the way round the bend. I think there is several places where it is two or three miles.

Q. That occur between going up and coming down?

A. You see, there would be a big long bend, and it might come up to a neck of land, say thirty or forty feet, and it would probably be a mile and a half or two miles all around the bend, and I have gone several times, gone all the way around the bend going up, and on coming back shoot across where it had broken through these necks of land.

Q. Was that so every trip up and down, or practically an experiment?

A. Well, no, sir; that would be putting it very strong to say that it was an experiment. We didn't do much experimenting. When there was any doubt we would throw a skiff in the river, put a couple of men in there and give them a pole, and sound across it. Sometimes we would put two men out on the shore to walk along the banks to see what the condition was.

Q. Then, instead of being an experiment, it was a kind of exploration trip?

A. Well, no; we were not exploring any unknown rivers, and not making reports. Where there had been any change in the water, 352 for instance, I would be at the wheel, coming along, and the current and channel was not clearly defined, would ring the bell and call to the mate, tell him to throw the skiff in the water and find out how much water there was. When I came back down never knew how much water I would find. If I got aground, I had my skiff in the river, laid a line, and pulled her through.

Q. These trips were tedious and slow, and the risk of going aground was then practically always before you, was it not?

A. Yes, sir; the chances of running aground was always before you. If you got out of the channel you would run aground.

Q. And the trips were painful and slow, were they not?

A. Painful.

Q. Now, as I understand you, then you couldn't say that there was an average depth of water in that river between any given points that could be depended upon at the time for navigation; at one point the water might be three feet deep to-day and after the flood had gone by it might

be ten feet deep, or it might be ten feet deep before the flood had gone by and no water there after the flood had passed; is that correct?

A. Yes, sir; that is correct in certain points.

Q. Did that condition maintain all the way between Brownsville and Rio Grande City?

A. The condition was about the same all the way through.

Q. How is it possible then for you to say that there was three or four, five feet or six feet of water in the river at that time on an average?

A. I don't think I have said that.

Q. Don't think you have said it?

A. No, sir.

Q. Never intended to say it?

A. No, sir; I haven't intended to say that there was any given depth of water at any particular time.

Q. Now, that continued in that way up, say, to 1888 or 1889; did it continue any longer than that, or did the change then occur?

A. Well, the river is getting steadily worse—that is, more trouble in crossings, and more line laying, and more pulling and hauling.

Q. You mean hauling the boat over the shallows?

A. Yes, sir; laying a line, putting it to the *captain*, and working the boat over the shallows.

Q. How many times was it usual or customary for the boat to run on shallows in that first period, or from 1883 and 1884 up to 1889 on a trip?

A. That is too much of a test for my memory, I think.

Q. Were the times too frequent for you to remember?

A. No, sir; I wouldn't undertake to say.

Q. Just want a general idea; of course we knew you can't give the number of times.

A. We run aground occasionally—always.

Q. Well, say; how many times was it; did it frequently occur that you would go aground on one trip up the river in 1883 or 1884?

A. That question is not exactly intelligible to me. How many times did it frequently occur?

Q. How many times was it usual that it would occur?

A. I wouldn't undertake to say, sir; I made trips without ever running aground at all.

Q. You have made other trips when you have run aground; a good many times, too?

A. Yes, sir.

Q. What was the longest time that you ever took to make the trip from Brownsville up to Ringgold City, from 1883 to 1884 up to 1889?

A. We consider twelve—thirteen days was a tough trip.

Q. What was the longest length of time you were aground on any sand bar on any of these trips in these early days, that you remember?

A. Been aground all night and part of the forenoon—I think was the longest in the early part of my experience.

Q. How did you haul the boat off the sand bar when you would run aground? What is the means employed to get it off?

A. That depended entirely, sir, upon the nature of the bar.

Q. What were the different means employed?

A. Well, after sounding the bar, the draughts between the draught

of the boat and the amount of water was not very great—that is, didn't run over six inches; we would lay what we called a head line and haul her head-on-haul her across.

Q. How; what power would you use?

A. Steam capstan. Then if the reach was very short—if the sand bar was very sharp we would use a snatch block and wheel—that is to say, instead of running the capstan, would run a rope out across a buoy, and by bringing it down to the side and running it in the snatch block, drag it out sideways, and by working the wheel could cause an artificial current and increase the current and wash the sand out. Then, once in a while we would turn stern on, where the sand bar was very great—where the boat stuck pretty hard; that was usual' downstream—lay a line to the bed of the boat and haul her up, then working the wheel and dig a channel out.

Q. Ever use Mexican mules—horse power?

A. No, sir; never used anything of that kind.

Q. In making these trips up the river or down the river, did you ever come to shallows where there was no channel?

A. Yes, sir.

Q. And have to make a channel?

A. Yes, sir; we have done that.

Q. Was that caused by there being no channel?

A. Well, I wouldn't undertake to state the cause. I think the shallows were the same as exist in all rivers—that is, the Red River is very much like the Rio Grande. It has alluvial soil, and the rising of the water will deposit sand and earth in one place and cause an obstruction, but what the real reason for it is I do not know; couldn't undertake to say.

355 Q. In making these trips up to Comargo, what was the difference between—what was the comparative difference between the amount of water in the San Juan and the Rio Grande proper—would the San Juan run into in those days?

A. I don't understand that.

Q. What was the comparative volume of the two streams in those days there?

A. I never went on the San Juan River when it was high. Nearly every time that I ever went up the San Juan River the muddy water from the Rio Grande worked up the river for a distance. The river was always smaller every time I was there with the steamboat. I have seen it when I was in the town of Comargo very high, but not with the steamboat.

Q. You mean to say that there was more water in the Rio Grande in those days above its junction with the San Juan than there was in the San Juan itself—just above its junction with the Rio Grande?

A. No, sir; I don't mean to say that.

Q. Which was the larger river at those places?

A. The Rio Grande.

Q. What do you mean by larger? I mean the one that has the most water?

A. Larger, as I understand it, means the one that will measure the more—that is, one river is larger than another if it has more water in it than the other. The Rio Grande was always larger, as far as my observation went.

Q. At the point of junction?

A. Yes, sir.

Q. Now, in 1883 up to 1889, you had an abundant opportunity to notice the amount of silt that was in the river and along its banks; did that amount of silt increase or decrease after 1883 or 1884, after you commenced to travel the river?

A. I can't say, sir; I did not observe it.

Q. Did the banks of the stream get lower or higher?

356 A. I don't think there has been any material change in the banks since I went on the river—that is, in the banks itself. I have seen silt deposited in an old cut-off. For instance, there are several places on the river where there was a lake where the river had formerly been—a cut-off had left a lake there, and there are several places now that I remember as likewise where there is a good body of water; water was deposited there each overflow, and to-day there is hardly anything to show where that lake used to be, and I think it is all from your thing of what you call silt or deposit carried by the river.

Q. Do you know whether the bed of the river has, as a general thing, between Rio Grande and Brownsville, has scoured out and grown deeper or whether it has filled up and raised the current of the river—raised the volume of it—body of it—of the water?

A. I don't.

Q. You can't tell whether the bed is lower or higher than it used to be?

A. No, sir; I have no means of ascertaining.

Q. Is there more or less vegetation along the banks of the river in that country now than there was in former years?

A. I have noticed no marked change.

Q. What is the character of the vegetation along the banks?

A. Well, that depends a great deal on the section of the country. Some places mesquite—mesquite trees are growing all along; other places it is barren and practically no trees at all, and at other places off the banks are forests.

Q. Any cottonwood forests?

A. No, sir.

Q. Have you seen the river in the neighborhood of El Paso on this trip?

A. Yes, sir; I saw a little of it, going across the bridge.

357 Q. How does the character of the banks and bed of the Rio Grande down between Brownsville and Rio Grande City compare with its general character and condition in this section of the country?

A. Well, I think, judging from a hasty view of it, I judge that the banks up here are more substantial—that is, that they remain longer in the same place; that there is less change by a rising up there than down near us.

Q. Well, now, when was it that you ceased to make your three trips a month with the "Bessie," and commenced to make your trips less frequently? I don't expect the exact date.

A. Well, before I left the river we began to have some trouble—a good deal of trouble with navigation, but just as to the exact date I can't state.

Q. When did your trips become less frequent between—

A. Oh, along in 1889 and 1890 began to have some trouble, and since, of course, since I left the river my brother has been running on the boats, and he has had a great deal more trouble than I ever had.

Q. When did you leave the river?

A. I think it was in 1890 or 1891.

Q. Then from 1888 or 1889 to 1891 the trips of the "Bessie" became less frequent up the river?

A. Yes, sir.

Q. Was that on account of the trouble in the river?

A. Yes, sir; to some extent, and then the business grew less—less business down in that section of the country that was tributary to our boat.

Q. How many trips did you make in 1889 and 1890?

A. On an average, in 1891, we got down to about two trips a month.

Q. About that time?

A. Yes, sir; about that.

Q. And how long did they continue at about that rate?

A. Well, until I left the river.

Q. And after you left the river, in 1890 or 1891, what decrease, if any, was there in the number of trips the "Bessie" made?

358 A. Well, here the last two or three years they have had a great deal of trouble, and the trips of the "Bessie" have very materially decreased.

Q. Was there any decrease in the trips from 1890 or 1891 to the last two or three years?

A. Yes, sir.

Q. They decreased then?

A. Yes, sir; they got less frequent. This year has been the worst they have ever had, I think.

Q. This year has been the worst they have ever had?

A. Yes, sir; I think so.

Q. And I believe you have stated that the best time for the "Bessie" to navigate was at dead low water, after the floods had passed through?

A. Yes, sir; when the channel was well defined.

Q. Yes, sir. Now, isn't it a fact that they have had higher floods down there this year than they have ever had in your recollection?

A. No, sir; I remember some other floods that we have had down there, just as high as they were here in October.

Q. Did they have any floods in June down there this year?

A. I think there was a slight overflow in June; not as much as it was in October of this year.

Q. Well, you suppose, now, then, from that, that there is good navigation there, do you, at the present time?

A. From what, sir?

Q. From the floods having come and straightened out the channel this year.

A. Well, no, sir; I would hardly form that conclusion.

Q. I understood you to say that the best navigation was after the floods came, and the high floods came this year in October?

A. Yes, sir.

Q. But you don't know of any benefit—

359 A. No, sir; I am afraid that you are making wrong deductions from my statement. I meant to say that in my experience the best stage of the river was after the flood has gone away, when it left a clearly defined channel.

Q. It is kind of a common joke down there, navigation of the river by the "Bessie"?

A. I don't know, sir, that it is a joke.

Q. Hav'n't you heard the people around there talk about Captain Kelly being in hopes that his steamboat would burn, so that he would get the insurance, as it was no longer a profitable business?

A. No, sir; the people are not given to that kind of talk with Captain Kelly while any of his friends are around.

Q. You don't know that it has occur'ed there?

A. No, sir.

Q. Do you know of the "Bessie" making a trip in 1897, up the river?

A. Any particular trip?

Q. Yes, sir; or any trip.

A. Yes, sir; she made several trips in 1897. Made a good many trips in 1897.

Q. Do you know how long it took her in 1897 to make a trip up the river?

A. No, sir; I don't remember of any particular trip. I said my brother has had a good deal of trouble with her.

Q. Can she make the trips in 1897 in thirteen or ten days, as she did in 1883 or 1884?

A. No, sir; I can't say that she could.

Q. Do you know that in 1897 it took her about thirty days to get up the river?

A. I remember of their having been that long on a trip; yes, sir.

Q. In 1897 you ever remember of hearing of a member of the International Boundary Commission being down there on a trip, and sending word down the river for the "Bessie" to come up and get them to take them down the river?

A. The International Boundary Commission?

360 Q. Or some of its members?

A. Yes, sir, some of its members; yes, sir, I remember of one of the commission—I think he was a member of the Mexican commission—being down to Rio Grande and sending for the "Bessie."

Q. What year was that in?

A. I don't know when it was; I know I was employed in the customs service at the time.

Q. You wasn't on the "Bessie" at that time?

A. No, sir; I was not on the "Bessie."

Q. Do you remember whether the "Bessie" was able to bring him down or not?

A. I remember that she had a great deal of trouble up there, and I think didn't get up there in time to accommodate this gentleman that sent for her.

Q. He came down overland, didn't he?

A. Yes, sir.

Q. Do you know how many trips the "Bessie" made in 1897 up the river, or in 1898?

A. Not accurately; no.

Q. Did she make over two or three trips in 1898?

A. Oh, yes; made many more than two or three; I know that.

Q. Where did she go to?

A. Rio Grande City.

Q. Clear up to Rio Grande City?

A. Yes, sir.

Q. She made many more in 1897 and many more in 1898.

A. Yes, sir.

Q. What became of that boat, the "Lulu D.," that you were on first?

A. She sunk.

Q. Whereabouts?

A. Brownsville.

Q. What was the cause?

A. She has played out.

361 Q. What condition is the "Bessie" in as to being played out?

A. She is fairly in good condition. She was passed by the Government inspector as she is.

Q. How old is she?

A. Probably about eighteen or nineteen years old, as near as I can guess.

Q. You say that from 1883 to 1884, up to 1889, the "Bessie" conducted a profitable freight business up that river?

A. Yes, sir; about that period the "Bessie" conducted a profitable business.

Q. What were the freight charges on the "Bessie" from Brownsville up?

A. The freight charges were twenty cents a cubic foot; it is on a basis of fifty cents a hundred pounds or dollar a barrel.

Q. You speak of freight being transported from Brownsville up the river by carts, in opposition to the "Bessie," and her meeting of competition; do the people up at Ringgold City get their freight from Brownsville that way—Rio Grande City?

A. From Brownsville to Rio Grande City.

Q. Up the river?

A. That could freight on the "Bessie."

Q. Was that the line for freight to be hauled into the country?

A. Into Rio Grande City.

Q. From whereabouts?

A. Not only from Brownsville.

Q. Where else from?

A. Heblbronville.

Q. What road?

A. Texas and Mexico. It runs from Corpus Christi to Laredo.

Q. What was the rate of freight charge by freighters from that point over to Rio Grande City?

A. That depended entirely upon conditions. It was from fifty cents a hundred to a dollar and a dollar and a quarter a hundred.

362 Q. The freight then from that point into Rio Grande City was shipped freighted on the "Bessie" up Rio Grande from Brownsville?

A. What time, sir?

Q. I don't mean at that time—meant at these prices?

A. Well, that depended upon what the price by carts was.

Q. You have stated that the price by wagon was from fifty cents a hundred from the railroad over to Rio Grande City and it was from 50 cts. to a dollar and a quarter per hundred by the "Bessie," have you not?

A. No, sir; I think you got my statement the reverse.

Q. Well, what was it?

A. You asked me what the freight rate on the "Bessie" was, and I told you the general freight rate was based on a basis of fifty cents a hundred pounds, and then you asked me as to the carts from Hebbornville, and I told you it ranged from fifty cents to \$1.25 a hundred pounds.

Q. Where does Rio Grande City get its supplies of freight mostly from, Brownsville or Hebbornville?

A. The greater portion of it now comes from Hebbornville.

Q. And they prefer to pay the higher prices from Hebbornville, rather than to get it around from Brownsville and pay fifty cents a hundred from Brownsville up on the "Bessie," do they?

A. They prefer—you say they prefer to make more one way than another?

Q. No, sir. Just answer my question. They prefer to pay fifty cents to \$1.25 a hundred from Hebbornville over to Rio Grande City, and get it from that way, than to pay fifty cents a hundred up from Brownsville, and get it in that way?

A. Just about the time I left home, they was soliciting—writing Capt. Kelly very frequently to run the boat up there. They wanted to make shipments out of there.

Q. Now, you have stated in your opinion the best time to run the "Bessie" was after the high flood; the only assistance then that the high floods give the "Bessie" is in straightening out the channel of the river and making it a uniform one, is it?

363 A. Yes, sir.

Q. During the period of high water, you don't consider it a good time to make your trips either up or down the river, do you, on the "Bessie?"

A. On making the trips during highwater—

Q. But you don't consider it the proper time—

To make this trips; well, it is a good time; it is true you can make the trip. The worst period for navigating the river is when we call a full river; that is, when the river is confined to its banks and very high. The current is very swift and it is harder to navigate the river then, but after it has flooded and has overflowed, the current is less swift, and it is easier navigated even on the flood.

Q. The floods come up and go down constantly, do they not?

A. Sometimes. If the boat got outside of the river, and the river fell constantly, she would be very likely to get stranded.

Q. Is there any navigation—has there been any navigation there between Brownsville and the mouth of the river?

A. Yes, sir; the river was navigated between Brownsville and the mouth of the river within my recollection, but not within my steamboat period.

Q. What has caused it to cease being navigated—what has prevented the navigation there?

A. I think the construction of a railroad from Point Isabel to Brownsville had more to do with the stopping of that trade than anything else.

Q. I want to ask you if the stage of water between Brownsville and Rio Grande City in the years 1883, 1884, and 1885 are better or worse for navigation, than it was in 1898 and 1899?

A. I think it was better, according to my best recollection.

Mr. HAWKINS. That is all.

Redirect examination:

Judge BURCH. Mr. Thornham, is there anything that you haven't
364 had an opportunity to explain, any part of your answers that you would like to explain? You have that opportunity.

A. No, sir; I don't think, sir, there is anything; the questions were very peculiar at first. I think I answered them correctly, as far as I understood them.

Q. You have had some observation of other rivers that were being navigated, have you, during the season of navigation?

A. Yes, sir.

Q. And low water?

A. Yes, sir.

Q. Are the conditions seriously different in the Rio Grande from those of other rivers; name the other rivers, and see whether it is seriously different?

A. The conditions on the Red River and Rio Grande are practically the same. The rivers are very similar. I arrived at that conclusion from my observation on one trip and by conversation and comparing notes with old Red River steamboat men.

Mr. HAWKINS. I move to strike out that last part of his answer, that he arrives at conclusions—strike out the whole answer.

Judge BURCH. I resist it; it was in the course of navigation that he was actually observing, that he talked with these men.

Mr. HAWKINS. I withdraw my objection, if you want it in.

The COURT. Proceed.

Q. The Red River that you speak of, is that the Red River which empties into the Mississippi above Baton Rouge and below Alexandria, in Louisiana?

A. Yes, sir.

Q. That is the river of common navigation, without your knowledge?

A. Yes, sir.

Q. For commerce and passenger purposes?

A. Yes, sir.

Q. Now, do I understand that that applies to the navigation of
365 the Rio Grande since 1897; since May, 1897?

A. I have not been on the Red River since 1897.

Q. But the conditions you have observed on the Red River, were they similar at low water to conditions on the Rio Grande since 1897?

A. My observation was made on the experience acquired while I was running on the Rio Grande, and the trip down the Red River—

Q. And your observation of the Rio Grande since May, 1897—

A. No, sir; not since May, 1897; because I have not been running on the river since May, 1897.

Q. Not regularly; have you been over it?

A. I made one or two trips since then.

Q. That is what I want to know.

A. Yes, sir.

Q. You have made one or two trips since May, 1897?

A. Yes, sir.

Q. How did the conditions since May, 1897, compare with those which you saw when you made the trips on the Red River?

A. About the same, sir.

Q. You mean in low water they would be substantially the same, or at high water, as the case may be? In other words, in what respect are they about the same?

A. Just a strong resemblance between the lower part of the Rio Grande and the Red River. Same class of steamboats that run on the Red River that are running on the Rio Grande.

Recross-examination by Mr. HAWKINS:

You mean to say that there is no more water in the Red River on an average than there is on the Rio Grande?

A. I wouldn't be prepared to go that far with the statement.

Q. Water is the only thing that makes the conditions that you have been talking about. You say the conditions are the same, and yet
366 you say that you are not prepared to say that—what do you mean by conditions?

A. There is a strong resemblance between the two rivers, on the banks, in the formation.

Q. Resemblance between the banks? You don't mean that to apply, then, to the resemblance between the amount of water?

A. No, sir; I would hardly go that far.

The COURT. How about bars and obstructions?

A. The formations are very similar; that is to say, I noticed that the bends and crossings were formed very much like the lower Rio Grande; that is the resemblance I referred to. Of course, I never sounded the water on the Red River and have sounded the water on the Rio Grande, and therefore couldn't make the comparison between the depth of the water.

The COURT. Did you note any obstructions in the way of bars, etc.?

A. Yes, sir; on my trip we ran aground two or three times.

Mr. HAWKINS. The Red River—the watershed of the Red River is a very heavily timbered section of the country, is it not?

A. Yes, sir.

Q. The Government keeps snag boats on the Red River, does it not, to keep it free from obstructions?

A. The Government has done a great deal of work on the Red River. I understand that they devote most of their time to cleaning it—what they call the raft on the river.

Q. Did you go up the river, on that trip of yours?

- A. Didn't observe it; no, sir.
 Q. Where did you go from and to?
 A. Fulton.
 Q. Where to?
 A. Down to New Orleans.
 Q. Did you go all the way in the boat?
 A. Yes, sir.
 367 Q. Didn't stop at Shreveport?
 A. Oh, yes; made stops all the way down the river.
 Q. You had to go right through the rapids to get down?
 A. Yes, sir; I believe so.
 Q. Didn't you get off your boat and get on another line, there below?
 A. No, sir.
 Q. You didn't?
 A. No, sir.
 Q. You know where Garland City is?
 A. No, sir; I do not.
 Q. You know where the crossing of the Cotton Belt road is?
 A. No, sir..
 Q. You know what kind of a bridge there is at the crossing—railroad bridge?
 A. No, sir.
 Q. What kind of a crossing is there on the Iron Mountain at Fulton?
 A. I didn't observe it very closely, sir.
 Q. When was this trip of yours made?
 A. I think it was 1888 or 1889; somewhere along there.
 Q. What was the condition of the river from twenty miles below Fulton, at the time you made that trip?
 A. Condition as to what, sir?
 Q. Navigability.
 A. I don't know; we went right along down the river.
 Q. What size boat did you go down in?
 A. Small boat.
 Q. How large?
 A. She probably was 130 or 40 tons, light-draught, stern-wheel boat.
 Q. You go all the way down to New Orleans in that same boat?
 A. Yes, sir.
 Q. Did that boat run aground on the trip down?
 A. Yes, sir; we struck once or twice, I think.
 Q. What season of the year was it?
 A. I don't remember what time of the year it was.
 Q. Don't remember whether it was summer or winter?
 368 A. No, sir.
 Q. What were you loaded with, from Fulton?
 A. Don't know what the cargo was.
 Q. Do you know whether it was loaded or not?
 A. I think they had some freight on; I have no definite recollection of it.
 Q. What is the height of the banks of the Red River along that route that you traveled? Were you stopped for twenty-four or forty-eight hours at any of the sand bars?

A. No, sir; as I remember it, there was not any such length of interference.

Q. Yet you don't know what the depths of the water was, and the width of the river, and the height of the banks, and you have testified that the shores were very heavily wooded; do you still stick to your statement that the conditions were practically the same as those that you have described on the lower Rio Grande?

A. What I intended to convey by my statement, and I wish to reiterate it, is that there is a great resemblance between the two rivers, that is all. Now, as I stated before, I have sounded the Rio Grande, and I did not sound the Red River, and my knowledge of the Red River is simply from taking the trip down. I met an old friend at Fulton, and he invited me to go down the river with me, and I went down, and my recollection of the whole business is a little hazy. This man I speak of had been down on the Rio Grande, and we have had several Red River steamboat men running on the boat with me. I think that is all.

Judge BURCH. You know of the Government having—

MR. HAWKINS. One minute. What time did you say you took charge of the "Bessie?"

A. I went to work on the "Bessie," I think it was 1883 or 1884.

Q. Were you in practical charge of it?

A. I was in charge of this department of it. I had charge of freight and making rates and collecting funds, and was the representative of the owner. I was quite young.

Q. How old were you at that time?

A. Between fifteen and sixteen—somewhere along there; I was very young.

Q. And at fifteen or sixteen you made the freight charges—had charge of the business department, made contracts?

A. Yes, sir.

Q. For the boat?

A. Yes, sir.

Q. I will ask you, during the years when you were in charge of it, were there not frequently several months at a time when you got no load of freight for the "Bessie" to carry either way, up or down the river, and when she was tied up because there was no business for her?

A. No, sir; not while I was connected with her. Of course, sometimes, after we have a full load up and a full load down, and then, again, we have had a light load down and a full load up. But usually we managed to make the trip so as to leave a net return at the end of the trip.

Q. What is the longest length of time you ever knew of the "Bessie" being tied up on a sand bar?

A. I think all night and part of a day. That is, we struck the sand bar—I recollect at once place—we struck late in the afternoon, and we laid our line in the afternoon, and lay there all night, and then were working until noon the next day.

Q. And what was the longest period that you remember, between the year 1883 and 1889, when there wasn't enough water in the river for a boat to either go up or come down?

A. I have no recollection of there ever being such a time when the "Bessie" was not able to go up or come down, as long as I was on the

river. Such a condition did not exist; that is, we never tied up because the river was too low to run.

Redirect examination:

Judge BURCH. Returning to the subject of the Red River, 370 you went down this river with the friend from Fulton, Arkansas, through Louisiana to New Orleans?

A. Yes, sir.

Q. And this was what year?

A. I think it was 1888 or 1889.

Q. You had then just about, or was about closing your personal navigation experiences on the Rio Grande, or had you closed it?

A. No, sir; I went back on the river after that?

Q. After that?

A. Yes, sir.

Q. And you went down as a passenger and an observer of what was going on, merely.

A. Yes, sir; I was on my way home, and I met this steamboat man there, and he asked me to go down the river with him, and told me I could ride without paying any fare, and I took advantage of it.

Q. You went to New Orleans, and from there home?

A. Took the ship from there home.

Q. In 1888 or 1889, did the Cotton Belt line—do you remember whether the Cotton Belt line crossed this river at all?

A. I don't know, sir.

Q. (To Judge Fall.) Is that the road that crosses at Alexandria? You have no particular recollection (to witness) of that particular place?

A. No, sir; I have a very faint recollection of the trip. I was around with the boys and dissipated a good deal.

Q. Did you ever navigate any of the other large rivers?

A. No, sir; I never navigated any of the rivers except the Rio Grande.

Q. I mean, did you ever ride up or down any of the large rivers except the Red River?

A. No, sir.

Judge BURCH. That is all.

371 JAMES J. HAYNES, another witness on behalf of the Government of the United States, the plaintiff, being duly sworn to testify the truth, etc., on being examined by Judge M. C. Burch, testified as follows:

On direct examination:

Judge BURCH. Where do you reside?

A. Laredo, Texas.

Q. What is your age?

A. Forty-six.

Q. What is your occupation?

A. Collector of customs for the district of Corpus Christi.

Q. Where does that run from, on the Rio Grande?

A. Comprises the counties in the Rio Grande flat, and sweeps around and takes in the two subports of Laredo and Carrizo, runs to Corpus Christi on the north.

Q. Where was you born?

A. Rio Grande City.

Q. How long did you live in Rio Grande City?

A. Lived there about six years.

Q. Do you mean to say you was six years old when you left there?

A. Yes, sir; when my father moved to Austin—I was about six years

old.

Q. When did you come back over—onto the river?

A. 1871.

Q. Have you had observation of the Rio Grande since?

A. Yes; I have lived on it at Laredo and Brownsville ever since.

Q. What portion of the time at Brownsville and what portion at Laredo?

A. Lived at Brownsville from July, '74. I was up and down the river during the summer of 1871. Went back to Austin in summer of 1872. Came back to Brownsville and lived there until July, 1874, when I moved to Laredo and lived there ever since.

Q. Then, from 1871 to 1874, with the exception you mention, you had observed the river at Brownsville?

A. Yes, sir.

372 Q. Know anything about navigation there?

A. Been up the river several times on the steamboat.

Q. What steamboats?

A. "San Roman," "San Juan."

Q. What is the full name of the "San Roman?"

A. "Jose San Roman."

Q. Was it during that period you have been up and down, or since?

A. Last trip I made was from Rio Grande City to Brownsville on the "Bessie." It was in 1888.

Q. And you say you have been since then living at Laredo?

A. Yes, sir. I have lived at Laredo since 1874.

Q. What stretch of river have you had any observation of during that time?

A. I have seen the river at different points, from Albuquerque to the mouth of the river.

Q. During this time?

A. Yes, sir.

Q. Now, coming back to 1871, your first observation of the river that you can remember; will you again state what boats were on the river at that time?

A. Three boats running from Brazos Santiago around over the bar and up the river to Brownsville.

Q. What were their names? Brazos Santiago on the Gulf, of course.

A. Yes, sir. "Magdalena No. 1" and "Magdalena No. 2," and 4 have forgotten the name of the other boat. They belonged to the Tamiritas. They were big steam freight boats.

Q. What tonnage would you say?

A. Well, I don't know. They would unload—two, I think, would unload an American Gulf steamer. They were used for that purpose. The American steamers would come over, and these boats would carry the cargo up to Brownsville.

Q. Over the bar?

A. Yes, sir.

Q. Now, above Brownsville—from Brownsville to Rio Grande City—what have you got to say as to that time, what was the tonnage—

373 A. The "San Roman" was a boat. It was a side-wheeler river steamer. It was over 200 ft. long. What the tonnage was I wouldn't know, not being a navigator.

Q. Ever ship any freight over it?

A. No, sir; never shipped any freight on it.

Q. What was the other boat?

A. The "San Roman."

Q. Besides the "San Roman?"

A. The "San Juan."

Q. Who owned these boats?

A. King & Kennedy.

Q. Any smaller boats running also, that you remember?

A. Well, after that?

Q. When did they begin, or about when?

A. There hasn't been a time since when there wasn't some boat on the river.

Q. You know anything about the stage of water on the river at that time?

A. There was better water—more water in the river at that time than at present.

Q. There was?

A. General average of water was better.

Q. When did you first know about any decrease of the waters of the river?

A. I noticed it in Laredo for about the last ten years.

Q. The last ten years?

A. Before then—from 1888 to 1889. May go back further than that. It has been gradually flowing less—the river at Laredo. Formerly it was a rather large river, but the last spring it was so that you could cross just below the railroad bridge—wade across it—the water—without getting up to your knees.

Q. What knowledge have you of the tributaries of the stream up and down?

A. I have crossed five—about the only tributaries that you could call rivers—Pecos and Devil's River, Concho, Salado, and San Juan.

Q. You have crossed all of these streams, have you?

374 A. Yes, sir.

Q. What can you say about that; what sort of a description can you give of these rivers? Just commence at San Juan on the Mexican side, at the bottom, and give us your knowledge of it.

A. The San Juan is a mountain stream—comes from out of the mountains of Mexico, flows quite a volume of water—

Q. From your personal knowledge, what is the volume or extent?

A. I have seen it at Camargo, where there is hardly any current. Seemed to be quite a body of water; current is very sluggish. I don't know that it ever stops running. The Salado River ceases to run. I have seen a sand bar across the mouth of the Salado.

Q. What do you say about the Concho?

A. I have crossed the Concho up about Chihuahua. I have never been at the mouth. Have crossed the Pecos where the Atchison, Topeka & Santa Fe Railroad crosses it in New Mexico. I have crossed it on the Southern Pacific also.

Q. Southern Pacific; that is down near the mouth?

A. Yes, sir.

Q. The Atchison, Topeka and Santa Fe is a good ways up, isn't it?

A. Yes, sir.

Q. Well now, your observation in connection with these rivers—of the upper part of these rivers. When did you first have observation of this river, say about El Paso, or about any of these rivers—were you ever on them?

A. Well, in 1888, on going from Kansas City to El Paso on my way to the City of Mexico, and coming down the river from Albuquerque—

Q. In 1888?

A. '88, and went back again. Very naturally watched the river, as the road goes right down the bank of the river most of the way.

Q. What rivers up in above Laredo, between there and El Paso; that is, those that you know of?

A. I remember—I think about the only river that amounts to very much is the Concho and Pecos, and Devil's River.

Q. What do you know about the size of the Devil's River where it empties into the Rio Grande?

A. Well, I crossed it two or three days ago, and there was a very small quantity of water running.

Q. Two or three days ago, you say; have you often crossed it?

A. No; first time I ever crossed it.

Q. What do you say about the width or size of it?

A. Isn't much of a river—very little water in it.

Q. Just a little brooklet or creek?

A. Yes, sir.

Q. How about the Pecos; what have you to say about that?

A. I think the Pecos furnishes the most water of any river that runs into the river, with the exception of the Concho. The Pecos probably furnishes more water than any one river that runs into the Rio Grande.

Q. Is that true in recent years, since their irrigation over there? Do you know the comparison in amount that it has furnished before irrigation commenced, or since?

A. I think the amount of water furnished by the Pecos has decreased.

Q. Decreased since they began irrigating?

A. Yes, sir; naturally. It would have taken out large quantities of water there. In former years we could tell sometimes where the rise would come; when the rise would come from the Pecos, from the reddish color of the water, which we haven't observed for several years.

Q. To the same extent, or haven't observed at all?

A. Well, yes, sir; sometimes; not to such a marked extent as formerly.

Q. How is it about the Concho? You say you have only crossed it at Chihuahua.

A. I have seen it in flood, and seen it when it was very low. The first time I crossed it it was a very small stream. There was some Mexicans driving some burros across it, and when I crossed it again it was probably 25 ft. deep and 100 yards wide.

Q. What was the color of it?

A. Clear when I saw it the first time, and muddy the second time.

Q. Had the appearance of any ordinary muddy stream?

A. Yes, sir.

Q. Apparently full of silt?

A. Yes, sir.

Q. What have you to say in regard to the waters of the Upper Rio Grande here; that is, from El Paso up, as to color and as to rises of them, etc.; have you kept any track of it?

A. Haven't kept any track of the rise, except that we occasionally hear of rises from the newspapers. Have never seen flood water at the river at El Paso to amount to anything.

Q. Did you observe anything about the flood after you got newspaper reports—anything of that kind, I wish you to say?

A. Yes; we would get notices of a rise at El Paso, and in a couple of weeks—fifteen days, perhaps longer—we would feel a rise at Laredo.

Q. How great were these rises, from—I mean, after you got track of the rises at El Paso?

A. Well, depended upon the amount of water that would come down from here, and also the additional amount furnished by other streams.

Q. Well, describe them; describe the rises, what you traced from the reports of newspapers as coming down from the Upper Rio Grande past El Paso.

A. The last I remember, and I remember it because I looked over the file of the newspaper, there was a reported rise at El Paso in May, 1897, and we had a nine-foot—eleven-foot raise at Laredo in June.

Q. How many days after?

A. Three weeks.

Q. Was it eleven feet all the while or eleven feet at the highest, did you mean to say?

A. At the height of a raise, as taken from the newspaper files.

377 Q. That was in 1897?

A. Yes, sir.

Q. How was it in 1898? Do you remember anything about the raise in 1898 above?

A. I was in Corpus Christi most of the summer of 1898, when we have our rises.

Q. And you don't have any recollection of 1898?

A. We had a rise there in 1898, but I don't know whether—don't remember whether it was as heavy; I know that it wasn't as heavy as this year.

Q. This year there was a rise, was there?

A. Yes, sir.

Q. When did it occur?

A. In June.

Q. Was there one later, in October?

A. In October, yes; I was down the coast then, but—

Q. You don't know about that?

A. Well, in a general way.

Q. Generally, do you know where that rise come from?

A. I think it came from all over the country.

Q. Do you mean all over the United States or that country. You mean the country tributary. Did you mean the Lower Rio Grande?

A. I suppose they had some of it here, but from Eagle Pass down to Brazos. It rained over in Mexico and all over Texas.

Q. That is your personal observation?

A. It rained at Laredo about $4\frac{3}{4}$ inches in twenty-four hours. The heaviest rain we ever had.

Q. And that caused a great rise in the river down there?

A. The highest rise I have seen in the river for many years.

Q. You say that for the last ten or twelve years the volume has apparently decreased?

A. Yes, sir.

Q. Of the river at Laredo. Will you fix a period when it first met your observation, and what time it continued—what the nature of the decrease was, whether it was constant or otherwise?

A. Well, I think I have observed more than the last ten years—since 1890, since 1889 and 1890 it has been gradually decreasing
378 in volume at Laredo.

Q. The river has?

A. Yes, sir.

Q. Is there, along there at Laredo, above or below, any irrigation that you know anything about?

A. Well, there is probably 200 acres irrigated by pumping from the river.

Q. By pumping?

A. Yes, sir.

Q. Nothing to amount to anything?

A. No; just small truck gardens.

Q. Is that as far as you know anything about, up and down the river; that all you know of?

A. All the irrigation? There is no irrigation, none at all. They just pump a little water out; a man may have a small farm of four or five acres and may raise cabbages, but not on a large scale, and what water is taken out is a small quantity and taken out by pumps from the river.

Q. You say the volume has constantly decreased, did you, in your opinion?

A. Yes; there has been a gradual decrease in the volume of the water.

Q. Suppose a dam was constructed above El Paso that would create a reservoir which would impound—that would hold 250,000 acre-feet, or eleven billion of cubic feet, and that was diverted into other uses, for irrigation and other purposes, would it in your opinion have any effect upon—any further effect upon the volume of the water down there?

A. Yes; taking that quantity of water out of the river would affect most any river.

Q. Would the effect in your opinion reach as far down as Laredo?

A. It would affect it all the way to the mouth.

Q. In what way would it affect it?

A. Taking that amount of water out of the river would stop the volume of the river to that extent.

379 Q. Decrease the navigability of the stream—would it have that effect?

A. It might. I don't know as it would or not. I don't exactly know. I know it is a large body of water. It is an immense quantity of water, and it would naturally affect the flow of the river; as to whether it would materially affect navigation below Rio Grande City I can't say.

Q. How is it along there? Is there any navigation along at Laredo?

A. No, sir; steamboat came up there once.

Q. Steamboat came up there once?

A. Came up on the flood once.

Q. How far is that above Brownsville by the sinuosities of the stream?

A. About 450 or 500 miles.

Q. How far overland?

A. About 225 miles.

Q. Is there any navigable capacity along there by Laredo?

A. No, sir.

Cross-examination by Mr. HAWKINS:

Q. That steamboat that came up to Laredo once, she never got back, did she?

A. They had to wait for another rise.

Q. Is she there yet?

A. No; we don't claim that we have a navigable stream at Laredo.

Q. How long did she wait?

A. I don't know; it was before I went to Laredo.

Q. Two or three years?

A. It might have been only one year. I just heard of it.

Q. When was it that you saw the boats which belonged to King, Kennedy & Company operating between Brownsville and the mouth of the river?

A. That was from 1871 up until the time we built the railroad from Point Isabel to Brownsville.

380 Q. What has become of those boats?

A. I think they were taken to Galveston.

Q. Business ceased to be profitable from the time the railroad was built from Point Isabel over to Brownsville, so that they had to go out of the business.

A. The road from Point Isabel to Brownsville is about twenty miles or twenty-five miles long, and of course they could get their freight there much quicker, and they avoided the danger of being held in some time—some days—by a northerly.

Q. Then it was difficult to get over the bar, anyhow, at the mouth of the river?

A. No, sir.

Q. Do you know the history of those boats, what they were built for, what trade?

A. They were running when I went to Brownsville.

Q. Don't you know that they were built for the purpose of running the blockade during the war of the rebellion, and in order to take cotton out from Brownsville to the Gulf?

A. No, sir; I don't.

Q. Don't know that? Do you know whether these boats took out papers under the American Government or the Mexican Government?

A. American Government. I don't think they ever landed at all on the Matamoras side of the river.

Q. Do you know who King, Kennedy & Co. got them from?

A. They had them in the service when I went to Brownsville.

Q. You don't know that they got them from the United States Government after the blockade running was broken up down there?

A. No, sir.

Q. How many rivers did you say you know of that emptied into the Rio Grande that would be considered rivers?

A. There are five.

Q. And they are what?

A. The San Juan, Salado, Conchos, Pecos, and Devils River.

381 Q. Which one of these is the largest?

A. Well, I don't know whether it is the Conchos or the Pecos; they are both long streams. I don't know the Conchos below where the Mexican Central road crosses it.

Q. Do you know which flows the most water in the Rio Grande—the San Juan or the Concho?

A. The Conchos, I think; quite sure of it.

Q. Do you know which flows the most water into the Rio Grande—the Pecos or the San Juan?

A. I think probably the Pecos, although the water from the Pecos have decreased.

Q. Do you know the Salado?

A. Yes, sir.

Q. Where is that?

A. That empties into the Rio Grande about 60 miles below Laredo, right in front of one of my subports.

Q. What size stream is that?

A. Well, that runs out into the mountains probably 200 or 250 miles.

Q. What size stream is it?

A. Where the Mexican International road crosses it—

Q. I am not talking about that—at its mouth; well go ahead.

A. At the mouth it is about the same size as up there. I suppose at the mouth it is 150 or 200 feet across the bed of the river.

Q. And how deep is it?

A. There is a deep pool about four miles from the mouth of the river which is full of water—filled; and from there to the mouth it is deep pool; sometimes running and sometimes it isn't running; sometimes there is a flood in it.

Q. Sometimes there is a flow flowing in it?

A. Yes.

Q. But as a usual thing what is its condition?

A. Well, I think it probably goes dry once a year.

382 Q. For how long a time?

A. Sometimes for two or three months it does not flow any water into the Rio Grande.

Q. Is there any irrigation along its course?

A. Very little.

Q. Are those waters diverted for use for any purpose?

A. I only know of one irrigated farm; belongs to Mr. Mechro.

Q. Have you been along the whole length of it?

A. No, sir.

Q. And had an equable flow?

A. From where I know it, you would have to pump the water to get it out. The banks are high.

Q. How far above the mouth is that?

A. I suppose 80 miles.

Q. Do you know whether there is any valley between that point and its mouth or not?

A. I think there is. I think the land is cultivated and irrigation between there and the mouth of the river.

Q. You don't know whether there is irrigation or not?

A. There is a friend of mine that has a small truck farm down there—

Q. You don't know how many farms there are?

A. — that pumps from the river; that is the only one, I think.

Q. You don't know anything about the cubic feet—anything of the volume of the stream?

A. No, sir.

Q. Can't estimate?

A. Couldn't tell whether there is fifty or two hundred and fifty; not an expert on that.

Q. How far along the course of the San Juan River were you over?

A. I have been up to Comargo and across to Matamoras. That is where the Carrizo and Mexican Gulf road crosses up towards the mountains; up at the foot of the mountains.

Q. Do you know whether there is irrigation along it or not?

383 A. Yes, sir.

Q. There is; to what extent?

A. I don't know; I know they have a number of irrigated farms at Matamoras; I don't know to what extent.

Q. Do you know the San Antonio stream?

A. Never hear of it.

Q. Do you know where it is at all?

A. Those are arroyos, I think.

Q. Do you know the San Rodriguez?

A. No, sir.

Q. Do you know where it comes in?

A. No, sir.

Q. Do you know the Santiago?

A. No, sir.

Q. Do you know the San Felipe?

A. No, sir.

Q. Do you know whether they come in above Laredo or below?

A. Never heard of them before.

Q. How much of the country between El Paso—now, I will say, between the Pecos and Laredo, which you have traversed along the general course of the river?

A. Between the mouth of the Pecos and Laredo?

Q. Yes, sir.

A. About thirty miles above Laredo.

Q. Do you know the Devils River?

A. I crossed it the other day on the railroad.

Q. Is that the only time you ever saw it?

A. Yes, sir.

Q. At what point did you cross it?

A. Right where it empties into the Rio Grande.

Q. Was there any irrigation along there, that you observed?

A. No.

Q. You don't know how long it is?

A. I know it is not a very long stream; probably 100 miles, or something like that.

Q. Just a guess about that?

A. Yes, sir.

Q. Do you know anything about its watershed—how many square miles there is in its watershed?

A. No, sir.

Q. Don't know anything about the amount of water which flows into the Rio Grande, except what you observed there that day?

A. That is all.

Q. Do you know whether it is a perennial stream or a flood stream?

A. I don't know; it was running when I crossed it the other day, but a very small quantity of water.

Q. Small quantity of water was running there the other day?

A. It was very narrow and shallow. I passed over it in the train on the bridge and didn't have time to observe it closely.

Q. What was the apparent width?

A. Didn't seem to be much wider than this room [room referred to about 12 ft. wide]; might have been twice as wide.

Q. Don't know how deep it was?

A. I suppose four or five inches, apparently.

Q. Don't know with what rapidity it was flowing?

A. It was going down over the rocks there—flowing at a moderate speed—can't say how many miles an hour.

Q. How would its flow compare with the flow of the San Juan?

A. The flow of the San Juan is fine—much larger stream than the Devils River.

Q. How much larger?

A. The San Juan, way up in the mountains, was larger when I saw it than the Devils River was at the mouth when I crossed it.

Q. Now, how many times have you ever crossed the Pecos River?

A. Twice—three times.

Q. Where?

A. I crossed it twice where the Atchison, Topeka and Santa Fe crosses it, and I crossed it just the other night coming to El Paso.

Q. The point where the Atchison, Topeka & Santa Fe crosses it up in the northern part of New Mexico, do you mean?

A. Yes, sir.

Q. What is the comparative difference between the flow of the Devils River, as you saw it, and of the Pecos?

A. Great deal—more water in the Pecos.

Q. Do you know whether the Pecos is a perennial stream or a flood stream?

A. I should say that it was a constantly flowing stream.

Q. Do you know of your own knowledge?

A. Never saw it but once, and it was flowing then—that is, the three times I crossed it.

Q. What size stream was it, as you saw it?

A. We crossed it at night once. Crossed it the last time over a high bridge—so' 320 ft. high—and it looked like quite a narrow stream down in the cañon. Couldn't make a guess as to the width of it.

Q. Can't tell anything about the width or depth?

A. The cañon looked to be about 80 to 100 feet wide, and it was 320 feet from the bottom to the top of the bridge. Gauging the river by the height, I should say it was from 80 to 100 feet wide, but I don't know whether it is that wide or not. It might be wider.

Q. Now, you say you saw it in the northern part of New Mexico?

A. Yes; it was probably 25 feet across it.

Q. That was just at its head waters?

A. I don't know how far from the head waters it is. You can see it on the map where the road crosses.

Q. It was simply a mountain stream where you crossed it on the Santa Fe, was it not?

A. Yes, sir.

Q. You don't know anything about the Pecos through its general course, character, or its continuity?

A. No; have no particular knowledge of it. Never seen it but at these two places.

Q. As a matter of fact, it heads up in the mountains, flows down some distance along its course until in about Peralta (?) it seeps along, and there sinks and disappears, does it not?

386 A. I don't know.

Q. You don't know that the Pecos proper really rises near Roswell, New Mexico, and that above there there is no Pecos, but it has sunk in its bed, did you?

A. No, sir; I didn't know.

Q. You don't know anything more about the San Juan in its general course, and how its waters disappear, or what its tributaries are, than you did about the Pecos, do you?

A. Don't think the waters of the San Juan disappear at any point from its source to its mouth.

Q. You don't know?

A. I feel pretty sure that it doesn't.

Q. What makes you feel sure?

A. Because it is a running stream.

Q. If I was to tell you that the Pecos was a running stream up at its head, you would feel sure that its waters didn't disappear?

A. No; the Pecos runs through a different country from the San Juan.

Q. What kind of country does the San Juan run through?

A. Over the mountains, where its head is, and there is not such a distance. It is a different character of country, and the waters of those rivers down there don't sink. The waters were flowing at every point I have known it.

Q. You stated that there was more water in 1874, you think, down

around Laredo than there is at present. As a matter of fact, you have no accurate knowledge, do you, of how much water there is at present at Laredo, or how much there was in 1874, so far as measurements go?

A. Well, in 1874, up at the island part of the river, every low water you could ford it on horseback; now you can wade, and it doesn't come higher than your ankle.

Q. Well, now, do you know whether it is due to filling up or loss of water?

387 A. Less water comes down the bed of the river; if the same quantity of water came down the bed of the river—if the bottom filled up, the water would rise with it. I can tell by the banks and water marks on the banks that it is lower now—has less water in it.

Q. That is just your general observation that you are speaking from?

A. I have naturally noticed it, living there.

Q. You say you crossed the Concho. Is there any irrigation on the Concho?

A. I think so, but I don't know positively; never seen any. I know that on nearly all of those rivers in Mexico they use the waters for irrigation where they can take it out.

Q. Nearly all of them have; do you know when they commenced to use it for irrigation?

A. Been irrigating for years and years.

Q. Do you know whether they have increased it within the past ten or fifteen years?

A. I don't know, but I suppose, naturally, they have.

Q. Has there been a more general increase in population out on this rivers during the last ten or fifteen years—Mexican population.

A. Along which rivers?

Q. These tributary rivers that come in from Mexico.

A. I don't know as to the Conchos; on the Salado and on the San Juan, up by Matamoras, I think there has been an increase in population.

Q. Last year, you say, the river was low just below Laredo?

A. This year and last year also.

Q. This year and last year the river was so low, you stated, as to permit you to wade across it just below the bridge at Laredo?

A. That is, the railroad bridge.

Q. I will ask you if that wasn't also the fact in 1884?

A. Possibly it may have been; I don't remember; it never stayed that way, like it is now. It might have been at one time, but not to

388 continue.

Q. Wasn't it so in December, 1883?

A. Can't answer yes or no, because, I say, it has not been down that way for any length of time so as to be noticeable as at present. I have noticed it now on account of it being much lower and staying lower than it has before.

Q. Have you noticed that more frequently since Mr. Sutton first asked you to be a witness in this case?

A. I noticed it more frequently before he asked me to be a witness. I don't think I have seen the river since Mr. Sutton asked me to be a witness.

Q. When was the bridge at Laredo washed away? In the last few years?

A. Not washed away at all.

Q. Not washed away at all?

A. Only the foundation has been washed so that they had to repair the bridge twice.

Q. When was that?

A. I think the first time was probably 1889, shortly after it was built. The first big rise after the bridge was built. I think it was finished in 1889.

Q. When was it washed prior to 1884?

A. No bridge there in 1884.

Q. Wasn't?

A. No, sir. Probably you refer to a railroad bridge—wooden railroad bridge of the International and Great Northern, that was washed out. Just had a temporary wooden bridge and that was washed out in 1883 or 1884. Never put it in again.

Q. You say that the amount of water furnished by the Pecos has decreased since irrigation enterprises commenced at Eddy?

A. I say, in my opinion it has.

Q. What is your opinion based on?

A. That being one of the principal streams feeding the river, 389 and the river has gradually decreased in the flow past Laredo, I naturally suppose that there is a great deal of irrigation along the Pecos and that we were getting less from there than formerly. And then also we could tell it partly by the color of the water. The Pecos is the very red water that empties into the Rio Grande.

Q. What is the color of the San Juan on a flood?

A. It is a muddy color.

Q. What is the color of the Concho on the flood?

A. About the color of the Rio Grande.

Q. And about the color of the Pecos?

A. No, sir.

Q. It isn't?

A. No, sir.

Q. When did you ever see the color of the Pecos?

A. Saw it when I crossed it.

Q. Was it on the flood then?

A. No; but it was red.

Q. It wasn't on a flood, but it was red and discharged into the Rio Grande?

A. I don't know whether it was discharging. I crossed it away up high.

Q. If it is red when it is not in a flood, how can you tell four or five hundred miles below?

A. By the quantity of water.

Q. But the quantity might come in from the Concho?

A. Yes; but there wasn't enough of that color of water coming in to effect the color of the river.

Q. Might come from El Paso?

A. I say no; not positive. That kind of water, the other water, is more of a yellow color.

Q. Which water is more of a yellow?

A. The El Paso.

Q. Can you swear that you know the color of the Pecos on a flood?

A. Yes. I have seen it at the head, and where it was red, up where the Atchison, Topeka and Santa Fe crosses it.

Q. Do you mean to say that it is red where the Atchison,

390 Topeka and Santa Fe Railroad crosses it?

A. It was at that time. It might have been a flood at that part of the river. I don't know. It wasn't a very large stream there.

Q. It wasn't?

A. No.

Q. You said, I believe, that it was about 80 feet wide?

A. No; I didn't. I said that it might have been that wide where the high bridge crosses it.

Q. What is the difference between the color of the Concho and the Pecos red?

A. The Pecos is a redder in flood time.

Q. Well, I didn't ask whether it was in flood.

A. At the time I saw it, it wasn't.

Q. You are here proposing to swear as to the color of the flood of the Pecos River, and that you know the water in the Pecos has decreased because that colored water has gone out of the Rio Grande down at Laredo in recent years?

A. No; I say in my opinion. That is one of the things I base my opinion on. I wouldn't swear that I ever saw the Pecos in flood.

Q. You mean to swear that you know the color of it in flood?

A. No; just simply my opinion of this fact.

Q. What in your opinion is the color of the Rio Grande in flood above the Pecos?

A. Well, it is yellow. You can see the color of it in the ditch out there.

Q. And it has that same color in the river?

A. About.

Q. Has it that same color all the time?

A. I don't know what the color of it is out here. Sometimes at Laredo it gets clear in low water. In warm weather it is quite clear, and, for that matter, also sometimes when it is in flood.

Q. And you don't know the color of these other tributaries?

A. Nearly all the streams when they are raised by a flood have a muddy color.

391 Q. How far is it from where you saw the Concho to the mouth of the Concho?

A. I have no idea.

Q. What was the color of the Concho when you saw it?

A. Clear when I first saw it, and it was muddy the second. I saw it at flood the second time.

Q. Where was it?

A. Where the Mexican Central—where we crossed it in Chihuahua.

Q. It has its source at the city of Chihuahua, or where?

A. I don't remember the town. Just beyond, on the south side of it.

Q. Will you swear, Mr. Haynes, as a matter of fact, that there is no particular difference between the color of the Concho River and the—I mean of the water in the Concho River in flood time from the color of

the water in the Rio Grande River at flood time or from that of the Pecos in flood time?

A. What do you mean to say—whether there is a difference between the Concho and the Rio Grande?

Q. I say, is there any difference in these three streams in flood time?

A. I can swear that I believe—

Q. Never mind what you believe.

A. From what I have seen of the three rivers there is a difference, to the best of my knowledge and belief. There may not be. I may be mistaken. I can't swear to it positively, like I would swear that you are sitting in that chair.

Q. When was it that you saw the Pecos?

A. Didn't say that I ever saw it in flood season—the Pecos.

Q. I mean the Rio Grande. When did you see the Rio Grande in flood season above the mouth of the Concho?

A. Didn't say I saw it in flood season.

Q. You are swearing as to its color.

A. Haven't said a word of the Rio Grande above the mouth of the Concho.

392 Q. Do you know what the color of the Rio Grande is above the Concho in flood time?

A. Well, I suppose it would be—I don't know that I ever saw the Rio Grande in flood time.

Q. Do you know the color of the Rio Grande above the Concho in flood time—during flood time?

A. No; I don't.

Q. Then, as a matter of fact, you can't tell down at Laredo whether particular-colored water had come in from the Rio Grande or Concho?

A. I couldn't get up and swear that that water was from any particular stream. A man feels sure of great many things that he couldn't get up and swear, positively, to.

Q. The Government feels pretty sure of winning this case?

A. I wouldn't swear to it.

Q. Did you say that the taking out of the waters at Eddy for irrigation would decrease the flow? You don't know that?

A. That is simply my opinion.

Q. Have any business, have any experiences in irrigation with it?

A. No, sir.

Q. Have no knowledge of the effect of impounding waters in reservoirs—what effect it has on the stream?

A. No, sir.

Q. You don't know, as a matter of fact, that any water has been taken out?

A. Never saw a drop taken out.

Q. Now you say that you would get notices of a rise in the Rio Grande at El Paso through the newspapers, then in two or three weeks you would get a rise at Laredo?

A. Yes, sir.

Q. How often did that ever occur?

A. Never counted the times, but nearly every year.

Q. Can you mention a year—a single year, when you are sure of it?

A. The only year I am sure, because I looked over the file of the papers, was in 1897.

Q. Was that during the great flood at El Paso?

A. I think the lower part of the town was under water.

Q. Was that the time the Government came to the relief of El Paso by a Congressional contribution?

293 A. I don't know positively.

Q. What month was it that you got the notice?

A. In May.

Q. And in June the rise was at Laredo? Might it not have been caused by other rivers than this?

A. I couldn't swear as to that. I know that we had the notice of the rise here. I saw it in the papers. We had an eleven-foot rise at Laredo. Might not have been all caused from this rise here.

Q. Might have come from the Pecos, Concho—might it not?

A. Yes, sir.

Q. What was the color of it?

A. I don't remember. I saw it in the paper, and it didn't state the color. If I had known I was going to be a witness I might have taken some points.

Q. You read the reports, just the rise at El Paso?

A. Yes, sir.

Q. It was described as a very great, destructive flood?

A. I think it was the time the lower part of the town was under water.

Q. It was described as the largest flood El Paso had ever known?

A. I don't remember that. I know it was a very destructive flood, and all the lower part of the town was under water, and a great many houses washed away.

Q. Yes, sir; and the rise at Laredo, you say, was eleven feet?

A. So stated by the paper.

Q. You don't know of your own knowledge?

A. Didn't measure it; no, sir.

Q. You were there at the time?

A. I was in Laredo.

Q. Didn't excite any comment there?

A. No; we have a rise there every year, about fall. We didn't consider that a very high rise. Down there—have a rise of twenty

394 and twenty-five feet.

Q. The newspaper stated it as an eleven-foot rise?

A. Yes, sir.

Q. Do you know how long the rise there continued?

A. Don't remember.

Q. The rises come up and then go and come up, intermittingly, don't they, for several days, while they are on?

A. Well, sometimes the river will rise and go down, and sometimes we have a big, high water for several days, and then gradually go down and not come up again.

Q. You can't name any other year in which you got the report of a flood in the newspaper at El Paso, and then afterwards had a high water at Laredo for weeks?

A. Never examined the files of any other year to fix it in my memory.
Mr. HAWKINS. That is all.

And now at this, the hour of 12 m., and adjournment of the hearing of the cause is had until 2 o'clock p. m.

And now at this the hour of 2 o'clock p. m., December 13th, 1899, the hearing of this cause is resumed.

Present as before.

ALBERT J. THORNHAM, recalled as a witness on behalf of the Government, on being examined by Judge N. C. Burch, testified as follows:

Judge BURCH. I will recall Mr. Thornham for the purpose of explaining a thing that came on on cross-examination. Mr. Thornham, in the course of your testimony this morning you used an expression, or made use of an answer something like this and in substance and
395 effect—in your opinion navigation was best at dead low water.

Unless possibly that may have a technical usage with you, I would like to have you explain what you mean by "dead low water;" whether it is absolute low-water mark or whether it is something else. Please state what you meant by de'd low water in your parlance down there.

A. In my steamboating experience we would put up at night—that is, didn't run during the night, and the night watchman placed a sound; and if the river ceased falling perceptibly—that is, if the fall is not over half an inch, we say the river is de'd low—that is, not falling perceptibly.

Q. Does it mean actual low-water mark, or does it mean a cessation of the rising and falling, or something of that kind?

A. It means practically a cessation of the perceptible fall. That is, if the river fell half an inch during the night the night watchman would report to the man going on watch: "River is on a stand."

Q. Well, now, you know what we mean by low-water mark; that is the lowest depth which water reaches. Do you mean that?

A. No, sir; because in my experience I have found that being five or six days on the trip up the river—found that the river had fallen in going up probably three or four inches at Fort Ringgold, whereas the night watchman had reported on a stand over night. It was scarcely possible that the river only fell during the night, therefore it must have fallen slowly every night.

Q. I don't know that we yet clearly understand one another. How high above what is called low-water mark might the river be, and still fulfill your usage of the term "de'd low water?" You mean simply dead water—that is, not rising?

A. No perceptible rise or fall during the night, because in the day as we were under way kept no record of it.

Q. How high, for instance, might the river be above low-water mark?

A. Might be a foot or eighteen inches.

Q. Then, your easiest navigation and nicest navigation—

A. Was when the channel was clearly defined. That is, after
396 the water ceased to be very muddy and the current had found its natural course, and therefore the channel would be clearly defined; make it easier for the man in the pilot house to see each way to steer.

Q. Then I will ask you—it doesn't mean low-water mark?

A. No, sir; it doesn't mean the lowest stage at which the river gets.

Q. Well, on your trip down the Red River, I will ask you if you travelled somewhat during the night?

A. Yes, sir; as I remember it, during the night.

Q. Night and day, both?

A. Yes, sir.

Cross-examination:

Mr. HAWKINS. In the explanation which you have just made about what you mean by "dead low water" you have conveyed the impression to me that you meant water that the current of which was neither rising or falling, but was uniform flow. Is that correct?

A. As indicated by the night watchman's report on his sound.

Q. And your navigation was best and most conveniently made under such circumstances?

A. Yes, sir.

Q. You make a remark on the closing of your examination just before noon with reference to the Red River trip, that previous to taking the same you had been out with the boys and were dissipating on the trip?

A. I don't know that I used the word "dissipate," but I think it would fit very effectively.

Q. You don't wish your observations as now remembered of that trip to be taken very seriously?

A. I hardly think they can be used to establish any special fact.

Redirect examination:

Judge BURCH. Any further explanations you wish to make?

A. I don't care to go into details.

Q. You hadn't been out with the boys all the way down the trip?

397 A. I had met some of the old steamboatmen that I had known during my river experience. They treated me to a good time—the best they knew how, in steamboat parlance. If any of you have ever been on a steamboat, you know what that means.

Judge BURCH. That is all.

JULES LACASSE, a witness on behalf of the United States, living at Rio Grande City, Starr County, Texas, having previously given his testimony by deposition, taking on direct and cross interrogatories, the said deposition was then read in evidence, as follows:

Interrogatory 1. Q. What is your name, age, residence, and occupation?

A. My name is Jules Lacaze; my age is 53 years and a few months; my residence Rio Grande City, Starr County, Texas; my occupation that of a merchant.

Interrogatory 2. Q. When did you first see the Rio Grande, how long have you had personal observation of it, and over what part of it has your personal observation extended? State fully.

A. I first saw the Rio Grande in 1864. In 1864 and 1865 I knew it from the mouth of the river, at Bagdad, up as far as Brownsville. In 1866 I knew it up as far as the Alamo, opposite Mier, Mexico. I have had personal observation of it for 35 years. This is the only part of said river of which I have had personal observation.

Interrogatory 3. Q. State what you know, if anything, by personal experience if you had any, as well as by personal observation, of the
 398 navigation of said river, the character of such navigation, the amount and extent thereof, and the time when such experience and observation began and ceased.

A. I have done no navigation of the river myself during that period except as an occasional passenger on the river steamers in former years. I had personal observation of the character of the navigation of the river. It has been by steamboats. During 1865 to about 1873 or 1873 the navigation of the river was by the "San Roman" and other boats, drawing four, five, or six feet of water. They run up as far as Rio Grande City at all seasons, and as far as Roma only during the higher stages of the water. The navigation during the time I had personal observation of the river has become more and more difficult on account of less and less water in the river. The only boat now on the river is the "Bessie." She has made two trips in 1898 and only one, I think, in 1899, for lack of water. Her last trip was in July, and it took her about seventeen days to make the trip. She is a very light-draft boat, drawing two or three feet at most. During the early part of the period I have mentioned there was a great deal of navigation on the river between the points I have mentioned, but now there is practically none, owing to lack of water. My observation has extended over the period from 1864 to this date.

Interrogatory 4. Q. State what you know from personal observation and experience, or either, concerning the navigable capacity of said river when you first knew the same, mentioning that part of its course which had a navigable capacity and what portions of the year it was navigable, naming the months or parts of months, according to your best recollection.

A. During the earliest part of the above period it was navigable at all times and seasons for the lighter boats, and during the months of May and June, when we generally had our spring rise, and during the months of September and October, when we generally had our fall rise, it was navigable for heavier boats like the "San Roman." The navigable portions are stated in my answer to interrogatory third, above.

399 Interrogatory 5. Q. State from your personal observation or experience, or both, whether since your first knowledge, if you have any, any change has occurred in the navigable capacity of said river, and, as nearly as you can, the year when such change became observable, the nature of such change if any, its extent, and any circumstance which from time to time occurred to impress such change upon your mind.

A. The change in the navigability of the above portions of the river took place in the last fifteen years. Up to that time boats could run up as far as Rio Grande City, and sometimes even as far as Roma. Since that time the river has had less and less water each year, and the navigation has become more and more difficult and less in volume until the present time, when it has almost ceased, except during an occasional flood. These facts have been known to me and impressed upon my mind because formerly I got my goods via Brownsville by steamer, and now I have to get them by another route.

Interrogatory 6. Q. State what, if anything, you know by personal

observation of the character of the streams which flow into the Rio Grande between its mouth, at the Gulf of Mexico, and the city of El Paso, Texas, as to the color of the waters of the same, if they have any peculiar colors; the extent of the waters they contribute to the Rio Grande; the time of the year when each is accustomed to furnish the greatest volume, and any other facts or circumstances within your personal knowledge affecting the navigable capacity of the river.

A. I have personal knowledge concerning only two of the tributaries of the Rio Grande, i. e., the San Juan, which empties into it at this place, and the Saladito, at Mier. The colors of the water of these two rivers is about the same as that of the Rio Grande from here down. They contribute ordinarily very little, if anything, to the waters of the Rio Grande. At flood times—about May and June and September and
400 October—they contribute a good deal of water to the Rio Grande.

Interrogatory 7. Q. State what, if anything, you know of the color, nature, and extent of the waters of the Rio Grande at and above El Paso, Texas, and in this connection state what you know, or have known from year to year since your knowledge began, of the affect of the flood waters, or so-called torrential flow, as to the time of the year when the same became manifest in navigation, and also state the same of the ordinary flow of waters, or so-called perennial flow—all of this as far as your knowledge will permit as to waters coming from and above El Paso.

A. I have no knowledge of the Rio Grande above El Paso.

Interrogatory 8. Q. State what you know from personal observation of the character of the bed of the said stream as to hollows or depressions; as to whether the same or any part is porous and capable of rapid absorption of water; as to sloughs or bayous and arroyos, so called, or any other feature outside of evaporation which would have a tendency to detract from navigable capacity during a low state of water and require to be filled before water coming down stream could be useful in tending to raise the river to a navigable height.

A. There are a great number of "arroyos" on each side of the river below here and they are filled only when the river becomes full from flood waters.

Interrogatory 9. State whether within your knowledge of the river there have been any changes in cutting timber along the stream or of any other nature than the diversion of the water for mining and irrigation purposes, tending to impair or reduce the navigability of the stream in that part of the same where it was navigable when you first knew it.

A. To my knowledge there is a little or no irrigation on this portion
of the river. There has been no cutting of the timber along
401 the part of the river I am acquainted with which would affect navigation.

Interrogatory 10. Q. State whether, from your experience and knowledge of the said river, the construction of a dam and the storage or impounding of any considerable quantity of water, and the diversion of the same for manufacturing purposes at a point across the same about 125 miles above El Paso, Texas, in the Territory of New Mexico, would have any influence upon the navigability of said river where it is now navigable, and if any, what that influence would be. Of this state fully, giving reasons.

A. In my opinion the construction of such a dam would make matters worse at this part of the river and render it less navigable even than it now is. My reasons for that opinion is that the flow of water would be manifestly decreased and we would have less water than now.

Interrogatory under Rule XXXIX. Do you know or can you set forth any other matter or thing which may be of benefit or advantage to the parties at issue in this cause, or either of them, or that may be material to the subject of this your examination of the matters in question in this cause? If yes, set forth the same fully and at large in your answer.

A. I know of nothing further of interest to either party hereto.

402 And the cross-interrogatories propounded to the said witness at the time of the taking of the said deposition aforesaid, and his answers to the same, were thereupon read in evidence as follows, that is to say:

1. Q. How long have you resided at the place of residence named by you, and how long have you been engaged in the business named by you in your direct examination? Where and at what place have you resided other than at the places so named by you, and from what time to what time at each of such places, and what other occupations have you been engaged in, and from what time to what time have you been so engaged in the same?

A. I have lived in Rio Grande City since 1866. Part of that time I have lived at Comargo opposite this place, about four miles distant from here. I have been in business in this place and at Camargo and Roma in this county since 1868. I came to Matamoros, Mexico, in 1864, from New Orleans, La. I have lived for three years, more or less, at New Orleans, to which place I came from France, where I was born. I was 14 years old when I came to New Orleans. Prior to going into business in 1868 I was a clerk.

2. Q. Are either of you now or have you been in the employ of the United States in any capacity, or have you worked for or been in the employ of the International Boundary Commission between Mexico and the United States, and if so, in what capacity?

A. I was U. S. consular agent in Camargo, Mexico, from 1892 to 1890. I have never been employed by or connected with the Boundary (International) between the United States and Mexico.

3. Q. If, in answer to direct interrogatory number two, you undertake to state how long you have had personal observation of the Rio Grande and over what part of it your personal observation has extended, please state how much of this river you have ever been over, and give the highest point on it you were ever on in person, and how often
403 you have been to such point in person.

A. I have personally been over the river from Roma, in this county, to the mouth of the river. The highest point on the river I have been is Laredo. I have crossed it there. I have been there three or four times, but I have paid no attention to it there.

4. Q. If you have stated that you have been on the Rio Grande and given the highest point at which you have been, please state whether you have traveled over the intermediate points between such highest point and Brownsville, Texas, in person, and if so, please state what intermediate points you have traveled over, and how often you have been over

such intermediate points or any particular one of the same, describing such point.

A. I have never been along the river between Roma and Laredo. The road I have traveled to Laredo does not run along the river. I have traveled on the river between this place and Brownsville very many times. I can not remember the number of times.

5. Q. If you have stated that you have had personal observation of any portion of the Rio Grande, please give the length in miles, measuring by the course of the river, that you have had personal observation over, and the length of the same measured in a direct line between the highest point and the lowest point which has been covered by your observation.

A. I can not state exactly the number of miles by the river between Roma and the mouth of the river, but I think it to be about four hundred miles. By the road which runs approximately direct between Roma and the mouth of the river it is about one hundred and fifty miles.

6. Q. If you have stated that you have had personal observation of any portion of said river, please name the tributaries which said river has on that portion of it covered by your observation, and also
404 please state the distance from tributary to tributary, coming up the river, and whether such tributaries come in on the American or Mexican side of the river.

A. The tributaries I know about are the San Juan and the Saladito, both of which flow into the Rio Grande from the Mexican side. From the San Juan to the Saladito, going up the river, it is about fifty or sixty miles. It is about 20 miles between the same points by land.

7. Q. If you have named any tributaries which come into the Rio Grande, or have stated that you know of any tributaries that come into the same, please state all the facts which you know with reference to such tributaries, and state where they rise, how long they flow, whether the valleys of such tributaries are settled or unsettled, whether the waters of such tributaries are used for irrigation or mining purposes, how such tributaries are used for irrigation or mining purposes, how much land is cultivated on each tributary, and whether the waters of such tributary are used for irrigation or mining purposes.

A. I think they have their rise in the Sierra Madre Mountains or the branches thereof, this side of Monterrey, Mexico. They have no steady flow. During the flood months of May and June and September and October they flow down a good deal of water. The valley of the San Juan is settled, there being many ranches along its banks. The other river I do not know about. There are some towns on the San Juan also. The head waters of the San Juan are used for irrigation. I do not know how much land is cultivated on these streams.

8. Q. If you have stated that any of the waters of the tributaries of the Rio Grande are used for irrigation or mining purposes, please state how much of the same, and how long they have been so used, and state how much land is cultivated on each tributary by means of the water of the same, and what portion of the waters of such tributaries are used for irrigation or mining purposes.

A. I know nothing about the matters inquired about in this interrogatory.

405 9. Q. If you have stated that any part of the water of such tributaries so flowing into the Rio Grande is used for irrigation or mining purposes, please state at what point on the same the waters are diverted from the streams for such purposes, and whether more or less water is now used on each of such tributaries, naming them, than was formerly used; and, if so, when the increase or decrease in such use commenced and when it reached its maximum.

A. I know nothing about the matters inquired about in this interrogatory.

10. Q. If you have stated that you know of any of the tributaries of the Rio Grande, please state whether any dams or reservoirs are on any such streams, naming them; and, if there are, where the same are situated, and in or across what streams they are constructed, and when they were constructed, and whether any of the same were constructed by authority of the Mexican Government or by its permission, if you know.

A. I know nothing about the matters inquired about in this interrogatory.

11. Q. If you have stated that you are acquainted with any of such tributaries of the Rio Grande, please state whether the flow of the same was or is constant, or whether the same is spasmodic or intermittent, describing in detail in this respect each particular tributary; 406 and also state whether such streams are known as flood streams or perennial streams, and at what seasons of the year their floods generally come, if they are flood streams, or if large floods come down the same, and how long such floods last, and what becomes of such floods.

A. They are flood streams. I mean the San Juan and Saladito. Sometimes they have no current at all. The floods occur generally during May and June and September and October and pass down the Rio Grande.

12. Q. If you have stated anything with reference to the navigation of the Rio Grande, please state the highest point on such river to which permanent navigation has ever extended.

A. Within my knowledge permanent navigation reached its highest point at Roma, in this county.

13. Q. If you have stated that you know anything with reference to the navigation of the Rio Grande, please state how many boats were ever used and employed in such permanent navigation, and how many are now used in the same, and what was the size and capacity of each of said boat or boats, and how much water each thereof drew, and how often such boats ascended or descended such river during each year, and during what months during the year they made their ascents and descents.

A. I can not give the names of capacities of each of the boats I have known in this trade. During the early part of the period I have known the river it was navigable up to Roma and during all seasons—during the flood seasons for the heavier boats and during other seasons for the lighter ones. Their draft ran from about two feet to six feet and their capacities from about 100 tons to 500 or 600 tons. The present boat is the smallest, being less than 100 tons. Some of the boats I have known on the river during that period were named as follows: Larger boats for the trade between Brownsville and Rio Grande City and Roma: "Jose San Roman," "San Juan," "Carrie Thorn," "Robert E. Lee," "Lula D.,"

and "John Scott;" smaller boats for the same trade—"Enterprise," "Jerry Galvan," "Little Fleeta," and "Andrew Ackley;" boats for the trade between Brownsville and the mouth of the river—"Matamorros No. 1" and ditto No. 2, "Tamaulipas No. 1" and ditto No. 2. There were others.

407 14. Q. If you have stated anything about any boats that navigated the Rio Grande at any time, please state whether such boats made their trips on such river on schedule time, and whether there were particular days of departure, which were adhered to or whether the trips were only occasional, intermittent, and without knowledge on the part of the public or boatmen as to when the boats would arrive at or depart from terminal or intermediate points at which they touched.

A. There were no schedule times for departure or arrivals.

15. Q. If you have stated that there ever was any navigation on the Rio Grande or is any navigation on it now, please state to what extent the points and people along said river depended upon such navigation for commercial purposes in the past, and to what extent they depend on the same at present, and as to whether they did in the past, or do now, depend mostly on such navigation; or do they depend mostly upon freighting to and from railroads and commercial centers.

A. During the earlier part of the time—I speak of the people along the river or that part of it to which I refer—depended on the river boating trade entirely and had no other means of receiving or shipping freight. We now depend entirely on freighting to and from railroad points and commercial centers as the river can not be used.

16. Q. Please state how long, in recent years, it would usually take a boat to ascend the Rio Grande from Brownsville, Texas, to Rio Grande City, and give the distance between Brownsville and Rio Grande City, when measured by the course of the river, and also the distance between said points along the usual traveled wagon road between the same.

A. During the earlier part of the period I speak of, it took from five to ten days for a boat to ascend the river from Brownsville to this place (Rio Grande City). It takes the "Bessie" now from fifteen to twenty days when she attempts to come at all. The distance from Rio Grande City to Brownsville by river is estimated to be about 300 miles and by the ordinarily traveled wagon road about 100 miles.

408 17. Q. Have you not personally observed hulls or wrecks of old boats inside the bar at the mouth of the Rio Grande and up the course thereof and some distance therefrom?

A. I have not seen any such wrecks. I have heard that some were wrecked on the river below Brownsville and some above, but I have never seen the wrecks.

18. Q. If you have said you observed any hulls or wrecks of old boats, as interrogated about, please state how these boats got there, and how far up the river their wrecks were observed by you, and state if you know how they came to be wrecked and when they were wrecked.

A. This question is answered in reply to the previous interrogatory.

19. Q. As matter of fact, is it not true that such boats got into the river over the bar at the mouth thereof, and is it not a fact that many of them were cut in two in order to get them over the bar, and were afterwards abandoned by the parties undertaking to use them? And if

"yes," state how long ago this occurred, and the reason, if you know, why the boats were so abandoned.

A. With a possible exception or two, all the boats I know or have known on the Rio Grande were brought in the mouth thereof and were used until they were wrecked or sunk. I never heard of anyone bringing a boat across the bar at the mouth of the river and being compelled to cut her in two to get her across and then abandoning her. I have an indistinct recollection that during the civil war one or two small steamers were built in the river near its mouth.

20. Q. If you have stated that you know anything of the character of such navigation, state whether or not vessels can come in from the Gulf of Mexico to the mouth of the Rio Grande at the present time, and how far up the river they can come from such Gulf. If you say they
409 cannot come into the mouth of such river or up the same, please state what prevents them from so doing.

A. There have been no steamers come in the river across the bar at its mouth for years. I think that the reason is that there is little water in the river and the bar is bad.

21. Q. Is there not an obstruction at the mouth of the river Rio Grande which prevents boats from going into the same from the Gulf of Mexico; and if so, what is such obstruction?

A. The only obstruction is the bar across the mouth of the river. There is little water now, I think.

22. Q. Do you know how much fall there is in the course of the river from Ringgold Barracks to the Gulf of Mexico per mile.

A. I do not know.

23. Q. What is the character of the current of the river Rio Grande immediately above its entrance into the Gulf of Mexico?

A. I do not know.

24. Q. Has the Rio Grande, for several miles from the mouth of the same, any appreciable current?

A. It has a current, but I do not know how much. I have not measured it.

25. Q. How far up the course of the river Rio Grande do the tides of the Gulf of Mexico affect the depth of the water in the river, and at what season of the year are these tides heaviest, and when at their
410 heaviest, how far up the river do they affect the current of the same?

A. I do not know.

26. Q. In describing the character of the navigation which you testified with reference to, please state what the average depth of the water near Brownsville is during the period when it is usually deepest, and how far up the river the depth continues the same.

A. I should think that when the river is full during the flood periods I have already stated it is possible twenty feet deep at Brownsville. I do not know how far up that depth would extend.

27. Q. At what period of the year is the depth of the river Rio Grande at Brownsville the greatest, and at what period is it the shallowest, and for how long does the depth continue at its maximum, and how long does it continue at its minimum?

A. It is deepest at flood seasons. It is shallowest at other periods.

It continues deep as long as the flood lasts and shallow until the flood season comes again.

28. Q. How shallow does the water get in the river at Brownsville?

A. Three or four feet—in the channel.

29. Q. What character of bed has the river Rio Grande, and is the bed of the same permanent or is it shifting? Is it rocky or is it sandy? Are there any shallows in it or any sand banks in it?

A. From Roma down the river bed is sandy, and in the lower part muddy. It is shifting. It is full of sand banks.

411 30. Q. If you have stated that there are either shallows or sand banks in the bed of the Rio Grande River, please state whether the same are below Rio Grande City, and if they are, if they are sufficient to in any way impede the navigation of the river, and if they are, for how long do they impede navigation?

A. The shallows and sand banks are both below and above Brownsville. They impede navigation at low stages of the water. There is a channel which runs through the shallows and banks in which the water is deepest.

31. Q. If you have stated what the condition of the bed or depth of the Rio Grande River is, please state how long such conditions have maintained within your knowledge.

A. The river has been more or less in its present condition or growing toward it for the last fifteen years.

32. Q. Was there ever, at any time within your knowledge, any great permanency to the channel of the Rio Grande River, so far as depth and course are concerned, or was the depth and course of the same constantly changing?

A. I think that the channel of the river has always been a changing one; sometimes changing from one side of the river to the other, but maintaining a uniform depth, except that, as already stated, it has been growing shallower during the late years.

33. Q. What effect, so far as changing the banks and the bed of the Rio Grande, would the heavy floods which came down the river have?

A. When the flood comes down it cuts away banks at some places and builds on at other. It frequently changes the course of the channel.

34. Q. How often during a trip up or down the river did the boat or boats which navigated the same ground upon these sand bars or shallows?

412 A. When the river was high they did not run aground. When it was low then often ran on sand banks.

35. Q. Did any one of you ever navigate the river Rio Grande on the steamer known as the "San Ramon" or a steamer bearing that character of name? If so, was that the correct name of such steamer, and if not, please give its correct name?

A. It is not the right name. The correct name was the "Jose San Roman." I have navigated the Rio Grande on her.

36. Q. If any of you have said that you have navigated the Rio Grande River in the steamer referred to in the last preceding interrogatory, state whether any of you have any personal recollection of a trip that such steamer made in the first half of the year 1873, when it took 42 days or thereabouts to go from Brownsville to Rio Grande City,

and if so, state what caused it to take such length of time and how long it took such boat to go back down the river from Rio Grande City to Brownsville? And if you state that it only required a few hours or a short time to do so, please state why such steamer was enabled to go back down the river more rapidly.

A. The boat referred to was the "San Juan." I can not say exactly the number of days, but I recollect that it was more than a month. Captain Charles Best was in command of her, and she was coming up here where a large amount of Mexican silver was waiting shipment. She could not get any farther than the Cuevas ranch, about twenty miles from Camargo. She returned to Brownsville with the first flood water, and that was the reason she took such a short time to return. She was withdrawn from the up-river trade then, as she drew too much. She made other trips afterwards during high water.

37. Q. Do you remember that on the trip referred to in the last interrogatory, after said boat reached Rio Grande City, a flood came down the river and furnished sufficient water to float the boat back down the stream without touching on the bars or shallows?

A. See my answer to the thirty-sixth cross-interrogatory.

413 38. Q. In describing the navigation of the Rio Grande, please state whether the same was in the past ever a financial success; and if so, during what period it was financially successful, and whether during the period it was so successful the navigation of the river was aided by either the Government of the United States or the Government of the Republic of Mexico?

A. I know that it was a financial success during the earlier part of the period I am testifying about. Messrs. Richard King and Millin Kennedy and others made large sums in such trade. For the last fifteen years I do not think it has been successful. I have never heard of either Government aiding the navigation of the river.

39. Q. Please state whether or not the navigation of the Rio Grande River at the present time is successful or otherwise.

A. It is not a success.

40. Q. Please state what the ruling price per hundred pounds and also per ton has been in the past, within your knowledge, for transportation between Brownsville and Rio Grande City when carried by boat and what the ruling price per hundred pounds and per ton river freight now brings on the steamboat "Bessie" between such points, and state whether there is any other steamboat plying the said river at the present time besides the "Bessie."

A. There were many tariffs, and they were changing. I can not say certainly, but I think an average price per ton between here and Brownsville when the trade was good was about \$10.00. The average price per ton per the "Bessie" now is about \$7.50 per ton, but depends somewhat on the kind of goods. There is no other boat besides the "Bessie."

41. Q. In connection with the shipment of freight up and down the river Rio Grande, state whether there are any railroads which were built along the same for any distance, on either the Mexican or
414 American side, or which compete with the steamer "Bessie" and on which side of the river such railroads are built, and the termini of the same, and when the same were completed, and for what commercial purpose the same were built.

A. There is a short piece of railroad running from Matamoras to near San Miguel de Las Cuevas, about 72 miles on the Mexican side. I do not think it competes with the "Bessie" very much, because there is no water in the river. The railroad freight rate is higher than the "Bessie's."

42. Q. Please state where the goods and supplies that are shipped over any such railroad for the Rio Grande country are delivered to the road.

A. The railroad serves the Mexican trade only, and the goods for that road are delivered to and by it at Matamoras and San Miguel and intermediate points.

43. Q. Before this railroad was built, what method was there of getting shipments of freight into Rio Grande City from distant points, other than by navigation from Brownsville, and what was the cost per hundred pounds or per ton of getting such shipments by such means?

A. The freight was shipped to Rio Grande City from Brownsville by boats on the river and by carts along the American side of the river. The said railroad does not bring any freight to Rio Grande City from any point and has never been used for that purpose. The rate by carts was a little higher than by boat.

44. Q. Before such railroad was built, were not the rates for river freight greatly in excess of the rates put into effect by such railroad and which now obtain on points along the Rio Grande River, and is not freight on goods and supplies shipped over the railroad and by boat to points along the river Rio Grande now very much less than before such railroads were built? If so, was not the reduction in such freight rates caused by the construction of such railroad, and did not the construction of such railroad thereby cause the declining in the navigation of the river Rio Grande?

A. The building of the road had no effect whatever on the declining of the navigation business on the Rio Grande. The freight rates are about the same. When the river became no longer navigable the freight for this point was begun to be shipped into Peña Station (now Hebbronville) on the railroad between Corpus Christi and Laredo, Texas, and by carts from Hebbronville, about seventy-five miles. Some goods were shipped to Laredo, Texas, and by carts from there down the river to this place.

45. Q. Could the navigation of the river from Brownsville up the stream be carried on after the construction of such railroad so as to successfully compete with the same in their freight rates between their termini and intermediate points along such river, and is not the decline of navigation on said river due to the inability of boats to compete with freight rates put in effect by such railroad?

A. This question has already been answered fully.

46. Q. Do you know the location of Comargo; and if so, how long have you known it, and was there ever any considerable amount of freight ascended such river on boats to Comargo, to such point?

A. I know Camargo. I have known it since 1866. I know that formerly a large amount of goods was shipped from American and European points to Comargo, the foreign goods coming in bond. These goods were shipped to Camargo by the boats on the river.

47a. Q. Was not Comargo a center for the supplying of interior points

of Mexico, even at great distance away therefrom? If it was, at what distance? Please state what sized place Comargo is now and what size place it was prior to the building of such road, and if it is a place of less size now. Please state if it is not also of less commercial importance than formerly. State if you know what has caused the decline of Comargo in population and commercial importance.

416 A. Yes; goods were shipped from Camargo as far at least as to Monterey. Before the time of the road was built Camargo had from 8,000 to 10,000 inhabitants. Now it has not more than 1,000. It has declined in commercial importance. I think it has declined because the goods that were formerly shipped through there now go largely by rail into Mexico from other points, as Laredo, Eagle Pass, etc.

47b. Q. Was not this decline of Comargo due to the construction of the Mexican International Railroad, running between Laredo and the interior points of Mexico, and connecting at Laredo with points in the United States? Does not such railroad now supply the interior points of Mexico, which formerly contributed to the commercial importance of Comargo, at cheaper rates of freight than could be had by navigation of the river?

A. Yes; I do not think there is much difference in prices of freight. I think that if the road was extended from San Miguel to Monterey the current of trade would change back again.

48. Q. If you have stated that any change has occurred in the commercial capacity of the Rio Grande River, and have undertaken to state the nature of such change, please state whether such statement made were all founded upon personal observations made by you or are partly or wholly suppositions or theories.

A. From personal observation.

49. Q. If you have undertaken to state that there are any changes in the navigable capacity of the Rio Grande River, please state what the effects of such changes were in the increase or decrease of the flow of the river at Brownsville. How much depth, more or less, did the
417 river take on at Brownsville and what was the effect? How much depth was there, more or less, at intermediate points between Brownsville and Ringgold Barracks, naming each place of prominence at which the water became deeper or shallower. At what points did you observe this effect? How often during the year when such effect was worked did you observe the same? How long did such effect continue?

A. I have answered this question hereinbefore as fully as I can.

50. Q. Do you know whether in the year when such effect was first observable or within a year or so before the same was observable, there was any use commenced of any of the waters of any of the tributaries of the Rio Grande for the purposes of irrigation or otherwise? If so, to what extent were such waters of such tributaries used?

A. There was no such use on this part of the river that I know of.

51. Q. Did you know where the San Juan River empties into the Rio Grande? Does it come from the American or Mexican side? What was the amount of water contributed by the San Juan to the Rio Grande, when you first knew the Rio Grande? Was it a considerable stream or an insignificant one? State how wide it was and about how deep and about the rapidity of its current where it emptied into the Rio Grande, if you know.

A. I do. From the Mexican side. At Camargo when it is high it is about 225 feet wide. It is now just the same as when I first knew it. When it is high it is 35 or 40 feet deep at Camargo. When it is low it is 4 to 6 feet. When it is low it does not run into the Rio Grande at all. When it is high a great deal of water runs into the Rio Grande. Camargo is three or four miles from the mouth of the San Juan.

52. Q. If you have stated that there was any change in the navigable capacity of the Rio Grande, commencing at any period named by you, state whether during the year of such change or subsequent thereto, the flow of said San Juan River was more or less than it has been in past years. And is the flow of such San Juan River more or less now than it was when you first became acquainted with the Rio Grande? If so, to what extent has it increased or decreased? State, if you know, the cause of such increase or decrease. Are its waters now used for irrigation at any point on its course?

A. The flow of the San Juan is now about the same as when I first knew it. Up at the head waters it is used for irrigation, in the State of Nuevo Leon.

53. Q. Please state if, before any change which you may have referred to in the navigability of the Rio Grande took place, you were acquainted with the amount of water flowing into the Rio Grande from the Salado, the San Antonio, the San Rodriguez, the Santiago, the San Philippe, Devil's River, Goodenough, the Pecos, and the Concho. If so, state where each of those rivers, or any one thereof, with which you may be acquainted, comes into the Rio Grande, with reference to the location of Rio Grande City; that is, the number of miles above such city the mouth of such rivers are. State about what was the size of each of those streams, the depth, width, and velocity of current at the point where the same entered into the Rio Grande. Please state which ones of said rivers were larger and which smaller than the others; also whether there had been any decrease, at the time of any change in the navigability of the Rio Grande occurred, in the flow of either of such streams. If so, which decreased in its flow from the time when you first knew the same up to the time when the navigable capacity of the Rio Grande underwent any change.

A. I do not know.

54. Q. As matter of fact, were you ever personally at the mouth of any of these streams? If so, please name the same, and state when and often you were there previous to such change in the navigable capacity of the Rio Grande; also how often you have been there subsequent to such change in its navigable capacity.

419 A. Was never at the mouth of any of them.

55. Q. If, in answer to the foregoing question, you should state that there has been any decrease or increase in the amount of water flowing in any of the tributaries above named, since the time when you first know the same, please state, if you know, what has caused such increase or decrease.

A. Do not know.

56. Q. Do you know that the flow of such tributaries and of the Rio Grande varies—any changes in accordance with the amount of rainfall which occurs from year to year over the watershed drained by such Rio Grande and its tributaries?

A. Do not know.

57. Q. Do you know that for a great many years past the rainfall in the watersheds adjacent to the Rio Grande and these tributaries in that section of Texas and Mexico has decreased, and is now less than it was in the years immediately preceding 1887 and 1888?

A. Do not know anything about the said tributaries. The rains have decreased in this section for about twenty years back. We have not had since 1889 the amount of rain here in one year that we have had this year.

58. Q. As a matter of fact, has there not been a draught in that section of the country since in the eighties, and has not this drouth resulted in the death of the greater portion of cattle and sheep, and even during periods necessitated the removal of portions of the population in various places along the river?

A. There has been a drought in this country for several years back.

59. Q. As matter of fact, is there now one-half as much rainfall as there was in that section of country in such former years?

A. I can not say exactly, but I do not think there is half as much rainfall now as in former years—as when I first came to this country.

60. Q. If, in answer to the sixth direct interrogatory you stated that you know anything by personal observation as to the colors of the water of any stream which flows into the Rio Grande between its mouth at the Gulf of Mexico and the city of El Paso, Texas, please state how you know the same.

A. I know the colors of the Rio Grande, San Juan, and Saladito from seeing them.

61. Q. At what points above the head of navigation did you ever observe personally the colors of the waters of any such tributary, and how many times did you ever observe the color of such water above the head of navigation?

A. I have not seen them above the heads of navigation.

62. Q. If, in answering interrogatory number six, you have stated that you knew the color of any water, did you answer from having seen the same during your navigation of the river and after such water had mingled with the waters of such stream where navigable, or did you get your idea of the color from having seen it come out of the tributary before it had entered the Rio Grande?

A. I have seen it in the tributaries themselves.

63. Q. Can you tell the color of the water of each of the following tributaries, respectively, San Juan, Salado, San Antonio, San Rodriguez, Santiago, San Philipe, Devil's River, Pecos, and Concho? If so, please state the color of each one separately.

A. I know the color of the San Juan. When high it is muddy and when at low stage it is clear blue-green in color.

64. Q. What is the difference between the color of the Pecos and of the Concho? What is the difference between the color of the Concho and of the Rio Grande before the Concho empties into it?

A. I do not know.

65. Q. If you undertake to tell the color of each one of these tributaries, state how you know the same and whether your statement is derived from hearsay or from actual observation.

A. I do not undertake it except as to San Juan, from personal observation.

66. Q. Were you ever at El Paso, Texas? If so, when and how often? Did you ever see the Rio Grande at such place? If so, what was the color of the Rio Grande at that place?

A. Was never there.

67. Q. Do you know that the color of any tributary of this stream is liable to vary and change greatly from time to time, in accordance with the droughts, the light floods, or the excessive floods, or even the particularly dry arroyos through which such floods from time to time enter such tributaries?

A. I do not know.

68. Q. Do you know if a heavy rainfall comes upon any particularly timbered section of a watershed of one of these tributaries making a flood in the tributary itself, that the color is liable to be very greatly different from the color of a flood in such tributary caused by an excessive rainfall in the nontimbered parts of the watershed of such tributary?

A. I do not know.

423 69. Q. If you say that you knew the color of the floods of the Pecos River which empty into the Rio Grande, please state whether in recent years there has been any change in the color of the Pecos floods?

A. Do not know.

70. Q. Witness Kelly is asked whether he is the same man who made an affidavit to be used in the trial of the injunction which was granted in this case, in 1896 or 1897, and whether it is true that he therein stated that he had not observed or heard remarked on the river any reference to waters which, from their color, appeared to come from the upper Rio Grande itself, since in the early eighties. In this connection, said witness is asked to state when he last observed flood waters, while on the navigable part of the Rio Grande, which from its color he judged to come from the upper Rio Grande.

(Directed to witness Kelly; see his testimony.)

71. Q. If it is true that witness Kelley has not observed any flood waters on the navigable portion of the Rio Grande, which from their color he judged to come from the upper Rio Grande, then is it not true, according to his observation, that the flood waters of the Rio Grande have not contributed materially to the navigation of that stream since in the early eighties?

(Directed to witness Kelly; see his testimony.)

424 72. Q. For how long a period during each year and at what time of the year is the amount of the water in the Rio Grande, in its navigable parts, substantially increased by flood flows coming in from its tributaries?

A. I have answered this question already. In the flood periods are hereinbefore given.

73. Q. During such period to what extent is that navigable depth of the Rio Grande increased and how much is such stream widened?

A. I have answered that before, as to the depth. In width it sometimes gets as wide as two or three miles, depending on the height of the banks.

74. Q. When such floods come are the waters confined within the banks, or do such floods rise over the banks of the Rio Grande and deposit waters in lagoons, lakes, and depressions?

A. The water runs over the banks on one or the other side of the river and into lakes and lagoons.

75. Q. What portion of any particular flood which may, in a week or ten days, pass Ringgold Barracks will reach Brownsville? Does the amount of water which will reach Brownsville from such flood, lasting, say, a week at the head of navigation, constantly decrease as it comes down the channel and deposit itself in such bayous and lakes, or is it absorbed by the sand?

A. I do not know. I have never calculated it.

76. Q. Have you any knowledge or information as to how far below El Paso water will run in the channel of the river before it is
425 absorbed and taken up by the sand, when, for five days or ten days or thirty days, at El Paso, such water ran one foot deep and fifty feet wide, or when it ran at any other particular depth or width for any given period of time at El Paso?

A. I do not know.

77. Q. Do you know what would be the effect of a flood at El Paso, Texas, which ran a thousand cubic feet per second for one day, or ten days, or twenty days, or thirty days, so far as increasing the depth and velocity of water in the river at Fort Quitman, Presidio del Norte, or the mouth of the Pecos, or Eagle Pass, or Rio Grande City, or Brownsville is concerned?

A. I do not.

78. Q. Do you know how much the river would be raised at Rio Grande City by a flood passing El Paso, Texas, amounting to 15,000 cubic feet of water per second, and running for ten days at that rate?

A. I do not.

79. Q. Do you know, in the month of May, 1897, whether any flood entered the Rio Grande from either the San Juan, Salado, San Antonio, the San Rodriguez, Santiago, San Philippe, Devil's River, Pecos, or the Concho? If you , which one of these streams do you know of any flood entering the Rio Grande from during that month?

A. If there was such a rise in the San Juan in May, 1897, it was nothing extraordinary about it. I do not remember precisely. May is about the flood season.

80. Q. Have you any knowledge as to whether any flood came
426 from either one of those tributaries into the Rio Grande during that month? Please state which one of them you do not know with reference to.

A. I do not know about any of them except the San Juan, and as to that only as above.

81. Q. Do you know whether there was a flood from either one of those streams entering into the Rio Grande during the present calendar year? If so, which one of them had a flood, and what month did the same occur in? If you do not know with reference to any one of the same during the present year, please state which one you do not know with reference to.

A. I know only as to the San Juan. There was a flood from that in September of this year.

82. Q. In interrogatory seven you are asked to state your full knowledge of the effect of the ordinary flow of water, and of the flood waters which come from above El Paso; as a matter of fact, have you had any personal observation which will enable you to state just what regular flow or flood flow comes from El Paso or above there, or are you simply depending upon hearsay as to that?

A. I do not know anything about the matter.

83. Q. Do you know anything about the amount of waters which have flowed regularly by El Paso since 1880 or previous thereto?

A. I do not.

84. Q. What was the width and depth of the water, flowing in the Rio Grande, passed El Paso, in 1880? What was it in 1885? What was it in 1890? What was it in 1895? What was it in 1899?

427 A. I do not know.

85. Q. Do you know during what years between those dates or previous to those dates the river has been absolutely dry at El Paso for any considerable number of months in the year; and if so, what months?

A. I do not know.

86. Q. Do you know what flood flows passed El Paso in the years above named? Do you know how long the flood of 1897, at El Paso, lasted?

A. I do not know.

87. Q. If you have testified as to any flood flows passing by El Paso during any of these years, state whether you were at El Paso and saw them or whether you were simply guessing that they passed El Paso because you saw them at some point further down the river?

A. I was not there and do not know.

88. Q. If you saw any floods down the river at any navigable part thereof, during any of these years, is it not possible that they may have come from some of the tributaries of the Rio Grande above named?

A. It is possible, but I do not know if they were?

89. Q. Is it not possible that such floods may have come from heavy rains along the Rio Grande below El Paso?

428 A. It is possible, but I do not know the facts.

90. Q. How far above El Paso were you ever? Did you ever come up the Rio Grande from the head of navigation to El Paso overland and observe the flow of the Rio Grande along its entire course?

A. Have never been above Laredo.

91. Q. If, in answer to interrogatory eight, you state that you have personally observed the bed of the said Rio Grande as to hollows or depressions, and that the same is porous and capable of large absorption, and that the same has sloughs or bayous and arroyos which have a natural tendency to detract from its navigable capacity during a low stage of water, and which have to be filled before the river can be raised by floods and increased flows, please state what ultimately becomes of the water which is consumed by such porous character of soil or which runs into such sloughs or bayous or arroyos?

A. The water in these arroyos is either evaporated or absorbed, or consumed by people and stock.

92. Q. Does this water stand in such sloughs and bayous until it is absorbed by the soil or by evaporation?

A. Already answered.

429 93. Q. If you state that you have observed such sloughs and bayous, state how far up the river you have observed the same, and whether practically the same condition does not continue up the stream to El Paso and north of that place?

A. The same condition prevails from Roma to the mouth of the river. I do not know if above Roma.

94. Q. If you state that such sloughs and bayous check and hold these waters, and such waters sink into the sand and are absorbed, please state if these facts would not tend to constantly decrease any floods which might pass El Paso and so decrease the same as to practically consume it, so that it would not substantially aid navigation where said river is navigable?

A. I do not know.

95. Q. If, in answer to interrogatory eight, you state that the flood waters of the river are necessary to fill bayous and depressions in order to keep the regular current flowing down, then please state whether, in your opinion, that result is the greatest good produced by these floods? As matter of fact, the floods are treacherous, are they not?

A. The filling of the bayous and arroyos does not tend to keep the current flowing. When the river gets very full these arroyos are filled also, and when the river goes down a part of the water from them flows back into the river, affecting the current for a few days only. The floods of the river sometimes are so sudden as to carry away crops on the low-lands.

96. Q. Are you acquainted with the steamer "Bessie;" and if so, 430 what relation towards it do any of you bear? Can the steamer "Bessie" come up the Rio Grande against the flood coming down the stream with any considerable force?

A. I am acquainted with the "Bessie." She is not related to me. She can not come up river against a heavy flood without a great deal of trouble.

97. Q. It is a fact, is it not, that it is exceedingly trying and dangerous to the safety of the vessel and the progress of the same to undertake to navigate the river depending upon the flood flow?

A. It is not dangerous.

98. Q. It is true, is it not, that if the steamer comes up the Rio Grande during a flood it is exceedingly liable to be stranded by reason of the subsidence of the flood before the steamer reaches its destination?

A. It is not dangerous in any way.

99. Q. Can the steamer "Bessie" come up the Rio Grande at all during the heaviest flood flows which occur along its navigable course? Is it not true that she can better navigate when the floods are not greatest, and that if the excessive floods were lessened she would make quicker and safer trips?

A. The "Bessie" makes her trips best when the floods are at a medium.

431 100. Q. How many irrigating ditches do you know of from the vicinity of El Paso to Brownsville, Texas? If any, where are the same located, and how much of the Rio Grande do they divert, and on which of the river are they, on the American or Mexican side?

A. I do not know of any.

101. Q. In direct interrogatory tenth, you are asked what would be the effect of storing water 125 miles above El Paso, Texas, so far as the navigability of said river is concerned. Do you know a point named as Elephant Butte, about 125 miles above El Paso, Texas? Were you ever at such point? Do you know whether the bed of the proposed reservoir at Elephant Butte is sandy or whether the river at that point flows through a rocky cañon? When were you there?

A. I am not acquainted with the Butte in question.

102. Q. Do you know the character of the bed of such stream below Elephant Butte down to a point of rocks just above Las Cruces, New Mexico? What is the character of the bed of such stream at such point?

A. As I have already stated, I know nothing about Elephant Butte.

103. Q. Have you ever been connected with an irrigation company or had any experience in the use of waters of reservoirs? If so, where, and what experience have you had? How large was the reservoir with which you had such experience?

A. I have no such connection nor any experience in such matters.

432 104. Q. Do you know what per cent of the waters which would be impounded by a dam thrown across the river 125 miles above El Paso, Texas, would pass off by evaporation?

A. I do not know.

105. Q. Suppose such dam held water fifty feet deep, ten miles long, and a mile wide, what amount, in depth, of such water in such place would pass off by evaporation, and how do you know that?

A. I do not know.

106. Q. Do you know how much such water, when being let out of such dam, and used in the neighbourhood thereof for irrigation without being taken out of the valley of the Rio Grande, would return to the Rio Grande and contribute to its flow? If so, what per cent would so return? What would become of the balance of the water? What part would pass off in vegetation? What per cent of what is lost would be due to absorption?

A. I do not know.

107. Q. What would be the effect upon the flow of the river at its navigable parts if the water of the stream so impounded at this point 125 miles above El Paso and used, as is asked in direct interrogatory tenth, for manufacturing purposes, and let back into the river into such quantities as would be sufficient to supply all ordinary manufacturing purposes which might be located thereunder?

A. I think the taking out of the waters at the point indicated would affect the river here to some degree. I do not to what extent, but

I think it would render the flow down here less.

433 108. Q. As matter of fact, have you sufficient technical knowledge to be certain what the effect of impounding the waters of the Rio Grande 125 miles above El Paso and using them along the banks of the stream for irrigation would have upon the flow? Do you not know it to be a fact that such acts would tend to equalize the average flow of such river?

A. I have no such technical knowledge.

109. Q. If 500 cubic feet of water per second were taken out of a reservoir constructed 125 miles above El Paso how much of it would reach El Paso and how much of it would be lost in the bed of the river itself by absorption and evaporation?

A. I do not know.

110. Q. If five hundred feet of water reached El Paso, Texas, traveling down the bed of the stream, after having been turned out of the reservoir 125 miles above El Paso, how much of it would be diverted out of the stream, by the Juarez Dam at El Paso, and flow off down the Juarez Canal on the Mexican side, and how much of it would be diverted by the El Paso wing dam and flow down to El Paso?

A. I do not know.

111. Q. If you have stated that the flood of waters of the upper Rio Grande ever reached the lower portion of the river, please state at what season of the year the floods usually come down the river.

A. In May, June, and September—October, unless occasioned by local rains.

434 112. Q. If any of the floods waters from El Paso or above ever come down the Rio Grande, and you have undertaken to state that there are any sloughs, bayous, or arroyos in the bed of the stream which such flood waters might fill up or that such flood waters do actually fill up the same, please state when the flood waters fill the same and how long the waters remain therein. State if it is not a fact that even if enough flood waters come down to fill the sloughs, bayous, and depressions in the bed of the Rio Grande that such flood waters would and do evaporate or disappear before the perennial flow of the Rio Grande comes down the same.

A. The part of the river that I am acquainted with has a current at all times. I know of no arroyos, bayous, or depressions in the bed of the river. The arroyos I have testified about are old river beds on either side of the river proper.

113. Q. Have not the floods of the Rio Grande at Presidio, Rio Grande City, Laredo, Eagle Pass, and Brownsville been greater during the present year than they have been for many years previous? If you answer that they have not, please state during what years, within the past ten years, and during what month in such years, there have been heavier floods than during the present year. In your answer name each year during the last ten years, and the month or months of each year during which the floods have been greater than they have during the present year at the points mentioned. And state if you know that the highest water reached by the water at each of such points during the present year and the time of such high water and the highest water at each of said points during the past ten years.

A. In August, 1894, we had at Rio Grande City the highest flood during the last ten years. I think that flood came from the San Juan. The next highest was in 1897, and I think that was in September and that it was from San Juan also. The next highest was during this year and I understand that the rise came from above Del Rio. That was in June.

435 114. Q. With whom have you conversed about giving testimony in this case? Were you asked to come in person at the trial of this case and give your personal evidence by anyone; and if

so, whom? When did you first see, or have read to you, the interrogatories and cross-interrogatories which have been propounded to you, and who first showed them to you and told you of the same?

A. I have never been spoken to by anyone about giving testimony in this case. I have never been approached to attend the trial of this case and testify in person. The first I knew about these deposition' was the summons of the commissioner to appear and answer them. I have never read over the interrogatories. They are being re'd over to me one by one by the U. S. Commissioner as I answer them now.

115. Q. Have you read over such interrogatories or cross-interrogatories with anyone previous to having the same propounded to you by the officer taking your deposition? If so, with whom did you read over the same?

A. No; not with anyone.

116. Q. Has anyone written out for you or furnished you with a written answer or suggested a written answer which would be suitable to any of the interrogatories or cross-interrogatories which have been submitted to you? If so, who has done so?

A. No.

117. Q. Has anyone suggested any portion of the answers or any portion of an answer to this' interrogatories; if so, whom?

A. No, one.

436 118. Q. Do you speak English, or have the questions been translated to you? If so, have your replies thereto been translated into English before being written down?

A. I understand English enough to understand the questions and be able to answer them. The questions have not been translated to me.

119. Q. In whose presence and where and on what day have you given these answers? Name everyone who has been present while you were giving this testimony, listening to the same. Has any attorney been present? If so, give his name, and state whether he was the attorney for plaintiff or for the defendant.

A. I have given these answers in the office of Henry F. Hord, an attorney in Rio Grande City. The persons present are and have been U. S. Commissioner Knox Jones and the said Henry F. Hord. The answers have been given on November 29th, 1899, and December 1st, 1899. The said Knox Jones and Henry F. Hord have both been present and are both attorneys. They are neither of them attorneys for either plaintiffs or defendants in this case.

120. Q. Has anyone representing the United States Government, or pretending to so represent it, been present at the taking of this testimony? If so, state his name.

A. No one representing the U. S. Government or pretending to represent it has been present at the taking of this testimony.

(Signed)

J. LACAZE.

437 JOHN E. MIX, another witness on behalf of the United States, living at Rio Grande City, Texas, having previously given his testimony by deposition, taken on direct and cross-interrogatories, the said deposition was then read in evidence as follows:

Q. What is your name, age, residence, and occupation?

A. My name is John E. Mix; my residence is Rio Grande City, Texas; my occupation is merchandising; my age is 63 last birthday.

Interrogatory 2. Q. When did you first see the Rio Grande? How long have you had personal observation of it, and over what part of it has your personal extended? State fully.

A. I first saw the Rio Grande in 1865 at Brownsville, Cameron County. I have had personal observation of it since that date. I lived in Brownsville till June, 1874, and then I moved to this place. My personal observation has extended from Roma down to the mouth of the river.

Interrogatory 3. Q. State what you know, if anything, by personal experience, if you had any, as well as by personal observation, of the navigation of said river—the character of such navigation, the amount and extent thereof, and the time when such experience and observation began and ceased.

38 A. To my own knowledge the navigation of the river up as far as Roma and Camargo, Mexico, has been good until late in the seventies or early eighties and from that time it has been getting worse and worse. My observation has extended over the entire period from 1865 to date. The navigation was by steamboats.

Interrogatory 4. Q. State what you know from personal observation and experience, or either, concerning the navigable capacity of said river when you first knew of the same, mentioning that part of its course which had a navigable capacity, and what portions of the year it was navigable, naming the months or parts of months, according to your best recollection.

A. It was navigable at all times, but in the summer months it was generally less so on account of there being less water. Sometimes when the boats were overloaded they had to be lightened to get over the bars and shallow places.

Interrogatory 5. Q. State, from your personal observation or experience, or both, whether, since your first knowledge, if you have any, any change has occurred in the navigable capacity of said river, and, as nearly as you can, the year when such change became observable, the nature of such change, if any; its extent, and any circumstances which from time to time occurred to impress such change upon your mind.

A. The river, to my knowledge and belief, has changed more at Rio Grande City than anywhere else. The river since the eighties has been less and less navigable. In the early eighties the boats could come up without much difficulty, but since then it has become mor' and more difficult, on account of the lessening of the water.

Interrogatory 6. Q. State what, if anything, you know by personal observation, of the character of the streams which flow into the Rio Grande between its mouth, at the Gulf of Mexico, and the city of El Paso, Texas, as to the color of the waters of the same, if they have any peculiar colors; the extent of the waters they contribute to the Rio Grande; 439 the time of the year when each is accustomed to furnish the greatest volume, and any other facts or circumstances within your personal knowledge affecting the navigable capacity of the river.

A. I have seen the San Juan, the Saladito, and the Salado. In summer they are muddy. The San Juan is clear, but it is not a running stream except in flood times. It is only in the rainy seasons that any of them contribute anything to the Rio Grande.

Interrogatory 7. Q. State what, if anything, you know of the color, nature, and extent of the waters of the Rio Grande at and above El Paso, Texas; and in this connection state what you know, or have known from year to year, since your knowledge began, of the effect of the flood waters, or so-called torrential flow, as to the time of the year when the same became manifest in navigation, and also state the same of the ordinary flow of waters, or so-called perennial flow—all of this as far as your knowledge will permit as to waters coming from and above El Paso.

A. I do not know anything about the waters coming from above El Paso. We used to get what we considered and called the snow rises, but now we get very little or none of them. They usually came down in July or August, or sometimes earlier than August.

Interrogatory 8. Q. State what you know, from personal observation, of the character of the bed of the said stream, as to hollows and depressions; as to whether the same or any part is porous and capable of rapid absorption of water; as to sloughs or bayous, and arroyos, so called, or any other features outside of evaporation which would have a tendency to detract from navigable capacity during a low state of water, and required to be filled before water coming downstream could be useful in tending to raise the river to a navigable height.

440 A. From about Roma down to the bottom of the river is generally quicksand, and down deeper, clay. There are no slough—arroyos in the river bed—between here and the mouth of the river that I know of.

Interrogatory 9. Q. State whether, within your knowledge of the river, there have been any changes in cutting timber along the streams, or of any other nature, that the diversion of the water for mining and irrigation purposes, tending to impair or reduce the navigability of the stream in that part of the same where it was navigable when you first knew it.

A. The only timber cutting along this part of the river that I have observed is for firewood. There is no water of the Rio Grande on this part of the river used for mining and irrigation purposes.

Interrogatory 10. Q. State whether, from your experience and knowledge of the said river, the construction of a dam and the storage or impounding of any considerable quantity of water, and the diversion of the same about 125 miles above El Paso, Texas, in the Territory of New Mexico, would have any influence upon the navigability of said river where it is now navigable, and, if any, what that influence would be. Of this state fully, giving reasons.

A. I think that the building of such a dam would affect this portion of the river, as we would then have less water down here. I mean that we would still have less water than we do now. My reason for thinking this is that I do not think the tributaries which actually run water into the river furnish enough water for navigation purposes.

Interrogatory under Rule XXXIX. Q. Do you know or can you set forth any other matter or thing which may be of benefit or advantage to the parties at issue in this cause, or either of them, or that may be material to the subject of this your examination or the matters in question in this cause? If yes, set forth the same fully and at large in your answer.

A. I know of nothing further to the advantage of either party herein.

441 And the cross-interrogatories propounded to the said witness at the time of the taking of the said deposition aforesaid, and his answers to the same, were thereupon read in evidence as follows, that is to say:

1. Q. How long have you resided at the place of residence named by you, and how long have you been engaged in the business named by you in your direct examination? Where and at what place have you resided other than at the places so named by you, and from what time to what time at each of such places, and what other occupations have you been engaged in, and from what time to what time have you been so engaged in the same?

A. I have resided here since 1874. I have been in the business of merchandising and contracting since 1869. I resided at Brownsville, Texas, from 1865 to 1874. I was railroading prior to 1865, in east Texas, from Houston to Harrisburg. I came there in 1854. I stayed at Richmond two years. I lived in Harrisburg also.

2. Q. Are either of you now, or have you been, in the employ of the United States in any capacity, or have you worked for or been in the employ of the International Boundary Commission between Mexico and the United States? And if so, in what capacity?

A. I have never been in the employ of the U. S. Government, except as a supply contractor. I have never been employed by the International Boundary Commission between Mexico and the United States. I was a clerk in the U. S. Commissary Department at Fort Brown, Texas, from 1865 to 1868.

3. Q. If, in answer to direct interrogatory number two, you undertake to state how long you have had personal observation of the Rio Grande, and over what part of it your personal observation has extended, please state how much of this river you have been over, and give the highest point on it you were ever on in person, and how often
442 you have been to such point in person.

A. I have travelled the river from the mouth of the river to Roma on steamboats. I have been up the river as far as Carrizo along its bank. From there up I do not know anything about it. I have crossed at Laredo and Eagle Pass.

4. Q. If you have stated that you have been on the Rio Grande and given the highest point at which you have been, please state whether you have traveled over the intermediate points between such highest point and Brownsville, Texas, in person; and if so, please state what intermediate points you have traveled over, and how often you have been over such intermediate points or any particular one of the same, describing such point.

A. I have been up as far as Roma on horseback, buggy, and by boat many times. I have been up to Carrizo also, and to Laredo as well, on horseback and buggy. By boat I have been to Camargo also.

5. Q. If you have stated that you have had personal observation of any portion of the Rio Grande, please give the length in miles, measuring by the course of the river, that you have had personal observation over,

and the length of the same measured in a direct line between the highest point and the lowest point which has been covered by your observation.

A. By land it is 260 miles from the mouth of the river to Laredo, and by water three times as far, more or less.

6. Q. If you have stated that you have had personal observation of any portion of said river, please name the tributaries which said river has on that portion of it covered by your observation, and also
443 please state the distance from tributary to tributary, coming up the river, and whether such tributaries come in on the American or Mexican side of the river.

A. All the tributaries that I know of between the mouth of the river to Laredo are the San Juan, the Saladito, and the Salado. They all come in the Mexican side of the river. They are none of them running streams at all times. From the San Juan to Camargo to the Saladito at Mier it is 25 miles, more or less, by land. From the Saladito at Mier to the Salado to Guerrero, it is about 35 miles.

7. Q. If you have named any tributaries which come into the Rio Grande, or have stated that you know of any tributaries that come into the same, please state all the facts which you know with reference to such tributaries, and state where they rise, how long they flow, whether the valleys of such tributaries are settled or unsettled, whether the waters of such tributaries are used for irrigation or mining purposes, how such tributaries are used for irrigation or mining purposes, how much land is cultivated on each tributary, and whether the waters of such tributary are used for irrigation or mining purposes.

A. Of my own knowledge, I know nothing about the matter, but I do know that they are not continuous running streams.

8. Q. If you have stated that any of the waters of the tributaries of the Rio Grande are used for irrigation or mining purposes, please state how much of the same and how long they have been so used, and state how much land is cultivated on each tributary by means of the water of the same, and what portion of the waters of such tributaries are used for irrigation or mining purposes.

A. I do not know.

444 9. Q. If you have stated that any part of the water of such tributaries so flowing into the Rio Grande is used for irrigation or mining purposes, please state at what point on the same the waters are diverted from the streams for such purposes, and whether more or less water is now used on each of such tributaries, naming them, than was formerly used; and if so, when the increase or decrease in such use commenced and when it reached its maximum.

A. I do not know.

10. Q. If you have stated that you know of any of the tributaries of the Rio Grande, please state whether any dams or reservoirs are on any such streams, naming them; and if there are, where the same are situated and in or across what streams they are constructed and when they were constructed, and whether any of the same were constructed by authority of the Mexican Government or by its permission, if you know.

A. There are no dams or any reservoirs on the tributaries between the mouth of the river and Laredo that I know of.

11. Q. If you have stated that you are acquainted with any of such

tributaries of the Rio Grande, please state whether the flow of the same was or is constant or whether the same is spasmodic or intermittent, describing in detail in this respect each particular tributary, and also state whether such streams are known as flood streams or perennial streams, and at what seasons of the year their floods generally come, if they are flood streams, or if large floods come down the same, and how long such floods last, and what becomes of such floods.

A. They are only flood streams. Their periods of flood last only a few days. The water from them goes down the Rio Grande and fills the rivers and bayous and arroyos along its banks. The flood seasons are generally in the spring and fall.

12. Q. If you have stated anything with reference to the navigation of the Rio Grande, please state the highest point on such river to which permanent navigation has ever extended.

A. Roma is considered the head of navigation.

13. Q. If you have stated that you know anything with reference to the navigation of the Rio Grande, please state how many boats were ever used and employed in such permanent navigation and how many are now used in the same, and what was the size and capacity of each of said boat or boats and how much water each thereof drew, and how often such boats ascended or descended such river during each year, and during what months during the year they made their ascents and descents.

A. I remember boats running from 1865. I knew the "San Juan" in the seventies; the "Grampus," a *stream* wheeler and a pretty heavy boat; the "San Roman," a side wheeler; the "Tamanlipas No. 1," "No. 2." They were iron-hulled boats, and their usual destination was from Brownsville down, but they made trips up here. The "Lee" was an iron boat also; also the little "Fleeta." I also remember the "Santiago," the "Jerry Galvan," "Carry Throne," the "John Scott," "Andrew Ackley." The only boat now plying is the "Bessie." There were others, the names of which I can not remember. They ran at all seasons. Sometimes there was one line of steamers and sometimes there were two. Some of these boats when loaded drew from three and a half to four feet.

446 14. Q. If you have stated anything about any boats that navigated the Rio Grande at any time, please state whether such boats made their trips on such river on schedule time, and whether there were particular days of departure which were adhered to or whether the trips were only occasional, intermittent, and without knowledge on the part of the public or boatmen as to when the boats would arrive at or depart from terminal or intermediate points at which they touched.

A. Such boats formerly made about two trips a month. They had no regular schedule time for leaving or arriving.

15. Q. If you have stated that there ever was navigation on the Rio Grande or is any navigation on it now, please state to what extent the points and people along said river depended upon such navigation for commercial purposes in the past, and to what extent they depend on the same at present, and as to whether they did in the past or do now depend mostly on such navigation, or do they depend mostly upon freighting to and from railroads and commercial centers.

A. Formerly they depended entirely on the boats, from Mier down,

except when carts went down the river occasionally. Now they freight from Laredo and Hebbronville on the railroad by land, as there is not enough water in the river for boats.

16. Q. Please state how long in recent years it would usually take a boat to ascend the Rio Grande from Brownsville, Texas, to Rio Grande City, and give the distance between Brownsville and Rio Grande City, when measured by the course of the river, and also the distance between said points along the usual traveled wagon road between the same.

A. The distance from here to Brownsville is about 300 miles by water and by the public road 110 miles.

447 17. Q. Have you not personally observed hulls or wrecks of old boats inside the bar at the mouth of the Rio Grande, and up the course thereof and some distance therefrom?

A. The hurricane of 1867 wrecked five or six boats on the river. I know of two or three boats which have been dismantled near Brownsville and sunk. There have been several boats wrecked between here and Brownsville. The U. S. dismantled the gunboat "Rio Bravo" at Fort Brown, near Brownsville, and sunk her.

18. Q. If you have said you observed any hulls or wrecks of old boats, as interrogated about, please state how these boats got there, and how far up the river their wrecks were observed by you, and state if you know how they came to be wrecked and when they were wrecked.

A. Some of them were wrecked by the storm and some by snags and by running of banks.

19. Q. As matter of fact, is it not true that such boats got into the river over the bar at the mouth thereof? And is it not a fact that many of them were cut in two in order to get them over the bar, and were afterwards abandoned by the parties undertaking to use them? And if "yes," state how long ago this occurred and the reason, if you know, why the boats were so abandoned.

A. I do not know about any boats having been cut in two.

20. Q. If you have stated that you know anything of the character of such navigation, state whether or not vessels can come in from the Gulf of Mexico to the mouth of the Rio Grande at the present time, and how far up the river they can come from such Gulf. If you say they 448 can not come into the mouth of such river or up the same, please state what prevents them from so doing.

A. Vessels of light draught can come over the bar, but they can not come up the river on account of lack of water. If light draft, they can come up, but not if loaded. Sometimes they can come up at flood seasons.

21. Q. Is there not an obstruction at the mouth of the river Rio Grande which prevents boats from going into the same from the Gulf of Mexico; and if so, what is such obstruction?

A. There is a shallow bar there, but I know of no obstruction to the navigation.

22. Q. Do you know how much fall there is in the course of the river from Ringgold Barracks to the Gulf of Mexico, per mile?

A. I do not know.

23. Q. What is the character of the current of the river Rio Grande immediately above its entrance into the Gulf of Mexico?

A. It is not swift; from Brownsville down there is little current.

24. Q. Has the Rio Grande for several miles from the mouth of the same any appreciable current?

A. No.

25. Q. How far up the course of the river Rio Grande do the tides of the Gulf of Mexico affect the depth of the water in the river, and at what season of the year are these tides heaviest, and when at their heaviest how far up the river do they affect the current of the same?

A. The tides do not run very high up the river, but I do not know how far.

26. Q. In describing the character of the navigation which you testified with reference to, please state what the average depth of the water near Brownsville is during the period when it is usually deepest, and how far up the river the depth continues the same.

A. I can not say.

27. Q. At what period of the year is the depth of the river Rio Grande at Brownsville the greatest, and at what period is it the shallowest, and for how long does the depth continue at its maximum and how long does it continue at its minimum?

A. It is deepest when the floods come, and at other times it is shallower. The floods season' are of short duration; I have already answered when the floods seasons are.

28. Q. How shallow does the water get in the river at Brownsville?

A. I have been away from Brownsville for a number of years and can not say.

29. Q. What character of bed has the river Rio Grande, and is the bed of the same permanent, or is it shifting? Is it rocky or is it sandy? Are there any shallows in it, or any sand banks in it?

A. It is shifting, and sand banks and shallows—plenty of them; I mean the lower part of the river.

30. Q. If you have stated that there are either shallows or sand banks in the bed of the Rio Grande River, please state whether the same are below Rio Grande City, and if they are, if they are sufficient to in any way impede the navigation of the river, and if they are, for how long do they impede navigation?

A. They are below Rio Grande City. They impede navigation until the flood season comes. There are some above Rio Grande City, too.

31. Q. If you have stated what the condition of the bed or depth of the Rio Grande River is, please state how long such conditions have maintained within your knowledge.

A. It has been in its present condition since about 1890, and has since then been getting worse and worse. By its present condition I mean as to difficulty of navigation.

32. Q. Was there ever at any time within your knowledge any great permanency to the channel of the Rio Grande River so far as depth and course are concerned, or was the depth and course of the same constantly changing?

A. The river was always, to my knowledge, good until about 1890 since 1865. It has always been chang'able as to location of channel, but there was always plenty of water for navigation until years.

33. Q. What effect, so far as changing the banks and the bed of the Rio Grande, would the heavy floods which came down the river have?

A. The floods would cut away the banks on both or either side of the river and change the location of the channel.

34. Q. How often during a trip up or down the river did the boat or boats which navigated the same ground upon these sand bars or shallows?

451 A. They frequently ran on the bars, but only remained on them a short time at best.

35. Q. Did any one of you ever navigate the river Rio Grande on the steamer known as the "San Ramon," or a steamer bearing that character of name; if so, was that the correct name of such steamer, and if not, please give its correct name.

A. I knew the boat; her name was "Jose San Roman."

36. Q. If any of you have said that you have navigated the Rio Grande River in the steamer referred to in the last preceding interrogatory, state whether any of you have any personal recollection of a trip that such steamer made in the first half of the year 1873, when it took 42 days or thereabouts to go from Brownsville to Rio Grande City; and if so, state what caused it to take such length of time, and how long it took such boat to go back down the river from Rio Grande City to Brownsville; and if you state that it only required a few hours or a short time to do so, please state why such steamer was enabled to go back down the river more rapidly.

A. I remember hearing of the trip, but am not certain if it was the "San Roman" or the "San Juan." I think that trip took about a month. She was heavily loaded, I understood. I was then living in Brownsville.

37. Q. Do you remember that on the trip referred to in the last interrogatory, after said boat reached Rio Grande City, a flood came down the river and furnished sufficient water to float the boat back down the stream without touching on the bars or shallows?

A. I cannot answer this question.

452 38. Q. In describing the navigation of the Rio Grande, please state whether the same was in the past ever a financial success, and if so, during what period it was financially successful, and whether during the period it was so successful the navigation of the river was aided by either the Government of the United States or the Government of the Republic of Mexico?

A. I understand that in the sixties and seventies a great deal of money was made by the people engaged in that traffic. I do not know that either government aided that traffic in any way except with their patronage.

39. Q. Please state whether or not the navigation of the Rio Grande River at the present time is successful or otherwise.

A. It is a failure now.

40. Q. Please state what the ruling price per hundred pounds and also per ton has been in the past, within your knowledge, for transportation between Brownsville and Rio Grande City, when carried by boat, and what the ruling price per hundred pounds and per ton, river freight, now brings on the steamboat "Bessie," between such points, and state whether there is any other steamboat plying the said river at the present time besides the "Bessie."

A. The freight rates in the sixties and seventies was higher than it is now. I have paid lately, during the last year, as high as a dollar a hundred on packages. The "Bessie" is the only boat in the river now.

41. Q. In connection with the shipment of freight up and down the river Rio Grande, state whether there are any railroads which were built along the same for any distance, on either the Mexican or American side, or which compete with the steamer "Bessie," and on which side of the river such railroads are built, and the termini of the same, and when the same were completed, and for what commercial purpose the same were built.

A. The only road of that kind is the road from Matamoras to San Miguel de Camargo. I think the road was completed in the late eighties. It was built for carrying freight and passengers. It does not compete with the "Bessie," and carries no freight for points on this side.

42. Q. Please state where the goods and supplies that are shipped over any such railroad for the Rio Grande country are delivered to the road.

A. At San Miguel de Camargo, Matamoras, and intermediate points.

43. Q. Before this railroad was built what method was there of getting shipments of freight into Rio Grande City from distant points, other than the navigation from Brownsville, and what was the cost per hundred pounds or per ton of getting such shipments by such means?

A. That road never to my knowledge brought a pound of freight to this place. We get freight by ox carts from Hebbronville and Laredo, Texas. From Brownsville up here I have paid as high as one dollar Mexican coin or its equivalent per 100 lbs.

44. Q. Before such railroad was built were not the rates for river freight greatly in excess of the rates put into effect by such railroad, and which now obtain on points along the Rio Grande River, and is not freight on goods and supplies shipped over the railroad and by boat to points along the river Rio Grande now very much less than before such railroads were built? If so, was not the reduction in such freight rates caused by the construction of such railroad, and did not the construction of such railroad thereby cause the declining in the navigation of the river Rio Grande?

45. A. I do not think that railroad had any effect on the navigation of the river. I do not know the rates on the railroad.

46. Q. Could the navigation of the river from Brownsville up the stream be carried on after the construction of such railroad so as to successfully compete with the same in their freight rates between their termini and intermediate points along such river, and is not the decline of navigation on said river due to the inability of boats to compete with freight rates put in effect by such railroad?

A. I have already answered this.

47. Q. Do you know the location of Comargo, and if so, how long have you known it, and was there ever any considerable amount of freight ascended such river on boats to Comargo to such point?

A. I know Comargo. It is opposite Rio Grande City. From 1865 up to late years there was a large traffic between Brownsville and Comargo both ways on the boats.

48. Q. Was not Comargo a center for the supplying of interior points of Mexico, even at great distance away therefrom? If it was, at what

distance? Please state what sized place Comargo is now and what size place it was prior to the building of such road, and if it is a place of less size now. Please state if it is not also of less commercial importance than formerly. State, if you know, what has caused the decline of Comargo in population and commercial importance.

455 A. It was such a centre. It formerly supplied points as far into Mexico as Monterey. The building of the road from the United States to Monterey, and from Monterey to Tampico, took away the traffic. It is the size as it used to be. The population is much less, and commercially it is dead.

476 Q. Was not this decline of Comargo due to the construction of the Mexican International Railroad, running between Laredo and the interior points of Mexico and connecting at Laredo with points in the United States? Does not such railroad now supply the interior points of Mexico which formerly contributed to the commercial importance of Comargo at cheaper rates of freight than could be had by navigation of the river?

A. I do not know about the freight rates, whether cheaper or not, but to the balance of the question I answer "Yes."

48. Q. If you have stated that any change has occurred in the commercial capacity of the Rio Grand River, and have undertaken to state the nature of such change, please state whether such statement made were all founded upon personal observations made by you, or are partly or wholly suppositions or theories.

A. From personal observation.

49. Q. If you have undertaken to state that there are any changes in the navigable capacity of the Rio Grande River, please state what the effects of such changes were in the increase or decrease of the flow of the river at Brownsville. How much depth, more or less, did the

456 river take on at Brownsville, and what was the effect? How much depth was there, more or less, at intermediate points between Brownsville and Ringgold Barracks, naming each place of prominence at which the water became deeper or shallower? At what points did you observe this effect? How often during the year when such effect was worked did you observe the same? How long did such effect continue?

A. I can only say as to Rio Grande City; it has been getting shallower each year.

50. Q. Do you know whether in the year when such effect was first observable, or within a year or so before the same was observable, there was any use commenced of any of the waters of any of the tributaries of the Rio Grande for purposes of irrigation or otherwise? If so, to what extent were such waters of such tributaries used?

A. There was no such use of the waters in this section. I have been told that such use was made about El Paso.

51. Q. Did you know where the San Juan River empties into the Rio Grande? Does it come from the American or Mexican side? What was the amount of water contributed by the San Juan to the Rio Grande when you first knew the Rio Grande? Was it a considerable stream or an insignificant one? State how wide it was and about how deep and about the rapidity of its current where it emptied into the Rio Grande, if you know.

A. I know where it empties into the Rio Grande. It empties in on the Mexican side. It only empties during flood seasons. It was such stream when I knew it. It is an insignificant stream, and has no current except at flood season.

52. Q. If you have stated that there was any change in the navigable capacity of the Rio Grande, commencing at any period named by you, state whether during the year of such change or subsequent thereto the flow of said San Juan River was more or less than it has been in past years. And is the flow of such San Juan River more or less now than it was when you first became acquainted with the Rio Grande; if so, to what extent has it increased or decreased? State, if you know, the cause of such increase or decrease. Are its waters now used for irrigation at any point on its course?

A. It has always been the same; it is so now.

53. Q. Please state if before any change which you may have referred to in the navigability of the Rio Grande took place you were acquainted with the amount of water flowing into the Rio Grande from the Salado, the San Antonio, the San Rodriguez, the Santiago, the San Felipe, Devil's River, Goodenough, the Pecos, and the Concho; if so, state where each of these rivers, or any one thereof with which you may be acquainted, comes into the Rio Grande, with reference to the location of Rio Grande City—that is, the number of miles above such city the mouth of such rivers are. State about what was the size of each of those streams, the depth, width, and velocity of current at the point where the same entered into the Rio Grande. Please state which ones of said rivers were larger and which smaller than the others; also whether there had been any decrease at the time of any change in the navigability of the Rio Grande occurred in the flow of either of such streams; if so, which decreased in its flow from the time when you first knew the same up to the time when the navigable capacity of the Rio Grande underwent any change.

A. I do not know anything about them except that the Salado and Salado do not run.

54. Q. As matter of fact, were you ever personally at the mouth of any of these streams? If so, please name the same, and state when and often you were there previous to such change in the navigable capacity of the Rio Grande; also how often you have been there subsequent to such change in its navigable capacity.

458 A. I have been to the mouth of the Salado for several years. I was there last about five years ago. It has not undergone a change since I have known it. I have been to the mouth many times.

55. Q. If, in answer to the foregoing question, you should state that there has been any decrease or increase in the amount of water flowing in any of the tributaries above named, since the time when you first knew the same, please state, if you know, what has caused such increase or decrease.

A. Have already answered.

56. Q. Do you know that the flow of such tributaries, and of the Rio Grande, varies any changes in accordance with the amount of rainfall which occurs from year to year over the watershed drained by such Rio Grande and its tributaries?

A. I do not know. We have had very little rainfall for nine years in this section.

57. Q. Do you not know that for a great many years past the rainfall in the watersheds adjacent to the Rio Grande and these tributaries in that section of Texas and Mexico has decreased and is now less than it was in the years immediately preceding 1887 and 1888?

A. It has decreased on both sides of the river.

58. Q. As matter of fact, has there not been a drouth in that section of the country since in the eighties, and has not this drouth resulted in the death of the greater portion of cattle and sheep, and even during periods necessitated the removal of portions of the population in various places along the river?

A. Yes.

59. Q. As matter of fact, is there now one-half as much rainfall as there was in that section of country in such former years?

A. No; there is not.

60. Q. If, in answer to the sixth direct interrogatory, you state that you know anything by personal observation as to the colors of the water of any stream which flows into the Rio Grande between its mouth at the Gulf of Mexico and the city of El Paso, Texas, please state how you know the same.

A. By seeing it.

61. Q. At what points above the head of navigation did you ever observe personally the colors of the waters of any such tributary, and how many times did you ever observe the color of such water above the head of navigation?

A. At the Salado a half dozen times or more.

62. Q. If, in answering interrogatory number six, you have stated that you knew the color of any water, did you answer from having seen the same during your navigation of the river and after such water had mingled with the waters of such stream where navigable, or did you get your idea of the color from having seen it come out of the tributary before it had entered the Rio Grande?

A. I saw the waters in the tributaries themselves.

63. Q. Can you tell the color of the water of each of the following tributaries, respectively: San Juan, Salado, San Antonio, San Rodriguez, Santiago, San Philippe, Devils River, Pecos, and Concho? If so, please state the color of each one separately.

A. I can only testify as to the Salado and San Juan. They are a blue-green color.

64. Q. What is the difference between the color of the Pecos and of the Concho? What is the difference between the color of the Concho and the Rio Grande before the Concho empties into it?

A. I do not know.

65. Q. If you undertake to tell the color of each one of these tributaries, state how you know the same and whether your statement is derived from hearsay or from actual observation.

A. From actual observation many times.

66. Q. Were you ever at El Paso, Texas? If so, when and how often? Did you ever see the Rio Grande at such place? If so, what was the color of the Rio Grande at that place?

A. I was never there.

67. Q. Do you know that the color of any tributary of this stream is liable to vary and change greatly from time to time, in accordance with the droughts, the light floods, or the excessive floods, or even the particular dry arroyos through which such floods from time to time enter such tributaries?

A. During floods the waters are muddy and at other times clearer.

68. Q. Do you know if a heavy rainfall comes upon any particularly timbered section of a watershed of one of these tributaries, making a flood in the tributary itself, that the color is liable to be very greatly different from the color of a flood in such tributary caused by an excessive rainfall in the nontimbered parts of the watershed of such tributary?

A. I do not know.

462 69. Q. If you say that you know the color of the floods of the Pecos River which empty into the Rio Grande, please state whether, in recent years there has been any change in the color of the Pecos floods?

A. I do not know.

70. Q. Witness Kelly is asked whether he is the same man who made an affidavit to be used in the trial of the injunction which was granted in this case in 1896 or 1897, and whether it is true that he therein stated that he had not observed or heard remarked on the river any reference to waters which, from their color, appeared to come from the Upper Rio Grande itself since in the early eighties. In this connection, said witness is asked to state when he last observed flood waters while on the navigable part of the Rio Grande which from its color he judged to come from the upper Rio Grande.

71. Q. If it is true that witness Kelley has not observed any flood waters on the navigable portion of the Rio Grande which from their color he judged to come from the Upper Rio Grande, then is it not true, according to his observation, that the flood waters of the Rio Grande have not contributed materially to the navigation of that stream since in the early eighties?

A. From, say, 1885, this way the flood waters have very materially assisted navigation, but before then the river was generally navigable without the aid of such floods.

463 72. Q. For how long a period during each year, and at what time of the year, is the amount of the water in the Rio Grande, in its navigable parts, substantially increased by flood flows coming in from its tributaries?

A. In the rainy season in the spring and fall.

73. Q. During such period to what extent is that navigable depth of the Rio Grande increased, and how much is such stream widened?

A. It is increased in depth ten or fifteen feet and in width a mile or more in places.

74. Q. When such floods come are the waters confined within the banks, or do such floods rise over the banks of the Rio Grande and deposit waters in lagoons, lakes, and depressions?

A. They rise over the banks and run into lagoons, lakes, and depressions.

75. Q. What portion of any particular flood which may in a week or ten days pass Ringgold Barracks will reach Brownsville? Does the

amount of water which will reach Brownsville from such flood, lasting, say, a week at the head of navigation, constantly decrease as it comes down the channel and deposit itself in such bayous and lakes, or is it absorbed by the sand?

A. It decreases as it comes down, by running into lakes, etc.

76. Q. Have you any knowledge or information as to how far below El Paso water will run in the channel of the river before it is absorbed and taken up by the sand, when, for five days or ten days or thirty days, at El Paso, such water ran one foot deep and fifty feet wide, or when it ran at any other particular depth or width for any given period of time at El Paso?

A. I do not know.

77. Q. Do you know what would be the effect of a flood at El Paso, Texas, which ran a thousand cubic feet per second for one day or ten days or twenty days or thirty days, so far as increasing the depth and velocity of water in the river at Fort Quitman, Presidio del Norte, or the mouth of the Pecos, or Eagle Pass, or Rio Grande City, or Brownsville, is concerned?

A. I do not know.

78. Q. Do you know how much the river would be raised at Rio Grande City by a flood passing El Paso, Texas, amounting to 15,000 cubic feet of water per second and running for ten days at that rate?

A. I do not.

79. Q. Do you know in the month of May, 1897, whether any flood entered the Rio Grande from either the San Juan, Salado, San Antonio, the San Rodriguez, Santiago, San Philipe, Devil's River, Pecos, or the Concho? If you , which one of these streams do you know of any flood entering the Rio Grande from during that month?

A. There was a rise in the San Juan in that month; I do not remember. There may have been. I do not know about the other rivers.

80. Q. Have you any knowledge as to whether any flood came from either one of those tributaries into the Rio Grande during that month? Please state which one of them you do not know with reference to.

A. Answered in the previous answer.

81. Q. Do you know whether there was a flood from either one of those streams entering into the Rio Grande during the present calendar year? If so, which one of them had a flood, and what month did the same occur in. If you do not know with reference to any one of the same during the present year, please state which one you do not know with reference to.

A. That I know of there was one from the San Juan. I think it was in June.

82. Q. In interrogatory seven you are asked to state your full knowledge of the effect of the ordinary flow of water and of the flood waters which come from above El Paso. As a matter of fact have you had any personal observation which will enable you to state just what regular flow or flood flow comes from El Paso or above there, or are you simply depending upon hearsay as to that?

A. I do not know anything about it.

83. Q. Do you know anything about the amount of waters which have flowed regularly by El Paso since 1880 or previous thereto?

A. No.

84. Q. What was the width and the depth of the water flowing in the Rio Grande passed El Paso in 1880? What was it in 1885? What was it in 1890? What was it in 1895? What was it in 1899?

466 A. I do not know.

85. Q. Do you know during what years between those dates or previous to those dates the river has been absolutely dry at El Paso for any considerable number of months in the year; and if so, what months?

A. I do not know.

86. Q. Do you know what flood flows passed El Paso in the years above-named? Do you know how long the flood of 1897 at El Paso lasted?

A. I do not.

87. Q. If you have testified as to any flood flows passing by El Paso during any of these years, state whether you were at El Paso and saw them or whether you were simply guessing that they passed El Paso because you saw them at some point further down the river.

A. I do not know.

88. Q. If you saw any floods down the river at any navigable part thereof during any of these years, is it not possible that they may have come from some of the tributaries of the Rio Grande above-named?

A. I can not tell. They might have come from said tributaries or from El Paso for all I know.

89. Q. Is it not possible that such floods may have come from heavy rains along the Rio Grande below El Paso?

467 A. They may have in so far as I know.

90. Q. How far above El Paso were you ever? Did you ever come up the Rio Grande from the head of navigation to El Paso overland and observe the flow of the Rio Grande along its entire course?

A. I was never at El Paso nor up the river except as above.

91. Q. If, in answer to interrogatory eight, you state that you have personally observed the bed of the said Rio Grande as to hollows or depressions, and that the same is porous and capable of large absorption, or that the same has sloughs or bayous and arroyos which have a natural tendency to detract from its navigable capacity during a low stage of water, and which have to be filled before the river can be raised by floods and increased flows, please state what ultimately becomes of the water which is consumed by such porous character of soil or which runs into such sloughs or bayous or arroyos.

A. I have stated that there were none such in the bed of the river in this section.

92. Q. Does this water stand in such sloughs and bayous until it is absorbed by the soil or by evaporation?

A. There are no sloughs, etc., in the bed of the river here.

468 93. Q. If you state that you have observed such sloughs and bayous, state how far up the river you have observed the same, and whether practically the same condition does not continue up the stream to El Paso and north of that place.

A. I have observed none such.

94. Q. If you state that such sloughs and bayous check and hold this waters and such waters sink into the sand and are absorbed, please state if these facts would not tend to constantly decrease any floods which might pass El Paso and so decrease the same as to practically consume it, so that it would not substantially aid navigation where said river is navigable.

A. I do not know about such sloughs above here.

95. Q. If, in answer to interrogatory eight, you state that the flood waters of the river are necessary to fill bayous and depressions in order to keep the regular current flowing down, then please state whether, in your opinion, that result is the greatest good produced by these floods. As matter of fact, the floods are treacherous, are they not?

A. The floods in this section of the river are treacherous. They are very sudden at times and take away growing crops on the lower lands.

96. Q. Are you acquainted with the steamer "Bessie;" and if so, what relation towards it do any of you bear? Can the steamer "Bessie" come up the Rio Grande against the flood coming down the stream with any considerable force?

A. I am acquainted with the steamer "Bessie." She is of little power, and can not, I think, steam a very flood. I have no relation toward her.

97. Q. It is a fact, is it not, that it is exceedingly trying and dangerous to the safety of the vessel and the progress of the same to undertake to navigate the river depending upon the flood flow?

A. It is trying and dangerous to the "Bessie."

98. Q. It is true, is it not, that if the steamer comes up the Rio Grande during a flood it is exceedingly liable to be stranded by reason of the subsidence of the flood before the steamer reaches its destination?

A. Yes; it is. The waters might run out and ground the boat.

99. Q. Can the steamer "Bessie" come up the Rio Grande at all during the heaviest flood flows which occur along its navigable course? Is it not true that she can better navigate when the floods are not greatest, and that if the excessive floods were lessened she would make quicker and safer trips?

A. She might, possibly; but her headway would be slow in such a flood. It is true that she can better navigate when the floods are not greatest, and that if the excessive floods were lessened she would make better trips than during a very heavy flood or during no flood at all.

100. Q. How many irrigating ditches do you know of from the vicinity of El Paso to Brownsville, Texas? If any, where are the same located and how much of the Rio Grande do they divert and on which of the river are they—on the American or Mexican side?

A. None.

101. Q. In direct interrogatory tenth you are asked what would be the effect of storing water 125 miles above El Paso, Texas, so far as the navigability of said river is concerned. Do you know a point named as Elephant Butte, about 125 miles above El Paso, Texas? Were you ever at such point? Do you know whether the bed of the proposed reservoir at Elephant Butte is sandy or whether the river at that point flows through a rocky cañon? When were you there?

A. I do not know said point. I was never there.

102. Q. Do you know the character of the bed of such stream below Elephant Butte down to a point of rocks just above Las Cruces, New Mexico? What is the character of the bed of such stream at such point?

A. I do not know.

103. Q. Have you ever been connected with an irrigation company or had any experience in the use of waters of reservoirs? If so, where and what experience have you had? How large was the reservoir with which you had such experience?

A. I have never been so connected.

471 104. Q. Do you know what per cent of the waters which would be impounded by a dam thrown across the river 125 miles above El Paso, Texas, would pass off by evaporation?

A. I do not know.

105. Q. Suppose such dam held water fifty feet deep, ten miles long, and a mile wide; what amount in depth of such water in such place would pass off by evaporation, and how do you know that?

A. I do not know.

106. Q. Do you know how much such water, when being let out of such dam and used in the neighbourhood thereof for irrigation without being taken out of the valley of the Rio Grande, would return to the Rio Grande and contribute to its flow? If so, what per cent would so return? What would become of the balance of the water? What part would pass off in *evaporation*? What per cent of what is lost would be due to absorption?

A. I do not know.

107. Q. What would be the effect upon the flow of the river at its navigable parts if the water of the stream so impounded at this point, 125 miles above El Paso, and used as is asked in direct interrogatory tenth for manufacturing purposes and let back into the river into such quantities as would be sufficient to supply all ordinary manufacturing purposes which might be located thereunder?

A. I think that it would injure the navigability of the river.

472 108. Q. As matter of fact, have you sufficient technical knowledge to be certain what the effect of *impounding* the waters of the Rio Grande, 125 miles above El Paso, and using them along the banks of the stream for irrigation would have upon the flow? Do you not know it to be a fact that such acts would tend to equalize the average flow of such river?

A. I do not think that such acts would tend to equalize the flow.

109. Q. If 500 cubic feet of water per second were taken out of a reservoir constructed 125 miles above El Paso, how much of it would reach El Paso and how much of it would be lost in the bed of the river itself by absorption and evaporation?

A. I do not know.

110. Q. If five hundred feet of water reached El Paso, Texas, traveling down the bed of the stream, after having been turned out of the reservoir, 125 miles above El Paso, how much of it would be diverted out of the stream, by the Juarez Dam at El Paso, and flow off down the Juarez Canal on the Mexican side, and how much of it would be diverted by the El Paso Wing Dam and flow down to El Paso?

A. I do not know.

111. Q. If you have stated that the flood of waters of the upper Rio Grande ever reached the lower portion of the river, please state at what season of the year the floods usually come down the river.

A. In the spring and fall of the year.

473 112. Q. If any of the flood waters from El Paso or above ever come down the Rio Grande, and you have undertaken to state that there are any sloughs, bayous, or arroyos in the bed of the stream which such flood waters might fill up or that such flood waters do actually fill up the same, please state when the flood waters fill the same and how long the waters remain therein. State if it is not a fact that even if enough flood waters come down to fill the sloughs, bayous, and depressions in the bed of the Rio Grande, that such flood waters would and do evaporate or disappear before the perennial flow of the Rio Grande comes down the same.

A. There are no such sloughs, etc., in the bed of the river in this section that I know of.

113. Q. Have not the floods of the Rio Grande at Presidio, Rio Grande City, Laredo, Eagle Pass, and Brownsville been greater during the present year than they have been for many years previous? If you answer that they have not, please state during what years, within the past ten years, and during what month in such years there have been heavier floods than during the present year. In your answer name each year during the last ten years and the month or months of each year during which the floods have been greater than they have during the present year at the points mentioned. And state if you know that the highest water reached by the river at each of such points during the present year and the time of such high water and the highest water at each of said points during the past ten years.

A. They have from here down, as far as I know. We had a heavier flood here during 1897 than during this year.

474 114. Q. With whom have you conversed about giving testimony in this case? Were you asked to come in person at the trial of this case and give your personal evidence by anyone; and if so, whom? When did you first see or have read to you the interrogatories and cross-interrogatories which have been propounded to you, and who first showed them to you and told you of the same?

A. I have conversed with Mr. Warner P. Sutton only. I also conversed with Mr. W. M. Reed, chief engineer Pecos Irrigation and Improvement Company, Roswell and Carlsbad, N. M., about the matter generally but not specifically about giving testimony in this case. He was the only one who suggested to me that possibly I might be needed in person in New Mexico to give evidence. The interrogatories and cross-interrogatories which are being propounded to me I first saw yesterday and to-day. They have not been read by me nor over to me except as propounded. Mr. Knox Jones, the U. S. commissioner, first showed them to me. He first told me about them when he served me with notice to appear and answer them.

115. Q. Have you read over such interrogatories or cross-interrogatories with anyone previous to having the same propounded to you by the officer taking your deposition? If so, with whom did you read over the same?

A. I have not read them over before this nor have been read over to me by anyone.

116. Q. Has anyone written out for you or furnished you with a written answer or suggested a written answer which would be suitable to any of the interrogatories or cross-interrogatories which have been submitted to you? If so, who has done so?

A. No one.

117. Q. Has anyone suggested any portion of the answers or any portion of an answer to these interrogatories? If so, whom?

A. No one.

475 118. Q. Do you speak English, or have the questions been translated to you? If so, have your replies thereto been translated into English before being written down?

A. I speak English. They have not been translated.

119. Q. In whose presence and where and on what day have you given this answer? Name everyone who has been present while you were giving this testimony, listening to the same. Has any attorney been present? If so, give his name and state whether he was the attorney for plaintiff or for the defendant.

A. On December 1st and 2nd, 1899, in the office of Henry F. Hord, attorney at law, Rio Grande City. The only persons present have been the U. S. commissioner, Mr. Knox Jones, and the said Hord. Jones and Hord are both attorneys. They do not represent either plaintiff or defendant in this case.

120. Q. Has anyone representing the United States Government, or pretending to so represent it, been present at the taking of this testimony? If so, state his name.

A. No one.

(Signed)

JOHN E. MIX.

476 ALBERT L. McLANE, another witness on behalf of the United States, living at Laredo, Texas, having previously given his testimony by deposition, taken on direct and cross interrogatories, the said deposition was then read in evidence, as follows:

Interrogatory 1. Q. What is your name, age, residence, and occupation?

A. My name is Albert L. McLane; age, 51 years; reside in Laredo, Texas, and am a lawyer by profession, but am now and have been on the bench as a district judge for the past nine years.

Interrogatory 2. Q. When did you first see the Rio Grande, how long have you had personal observation of it, and over what part of it has your personal observation extended? State fully.

A. I first saw the Rio Grande about 1850—since I can remember. I observed the river at Brownsville until about 1859. I then left Brownsville on the steamboat "Grampus," which took me to Idianola, and this was the only time that I saw the river below Brownsville to its mouth. In 1874 I came to Laredo, where I have continued to live, and I have observed the river at Laredo since that time. I have been down the river from Laredo to Rio Grande City once only, in December, 1874, but have been to Carizo, opposite Guerrero, frequently, and up the river to the coal mines, about 25 miles above Laredo, five or six times since 1882 or 1883. This is as far as my personal observation and knowledge of the river extends.

Interrogatory 3. Q. State what you know, if anything, by personal experience, if you have any, as well as by personal observation, of the navigation of said river, the character of such navigation, the amount and extent thereof, and the time when such experience and observation began and ceased.

477 A. The steamboat "Grampus" and "Ranchero," commanded by Capt. Mifflin Kennedy and Capt. Richard King, navigated the Rio Grande from its mouth up to Rio Grande and Roma, in Starr County, ever since I can remember, until I left Brownsville, in 1859. Of my own knowledge I can not speak after that time. These steamboats appeared to my inexperienced eyes as very grand affairs, but if I saw them now it is very likely that they would appear very greatly "shrunk." I think that they made regular trips once every month, each boat, but as to this I will not be positive. I know that at the time they were delayed by low water, and it is very probable that between November and May of each year that did not navigate the river above Brownsville.

Interrogatory 4. Q. State what you know from personal observation and experience, or either, concerning the navigable capacity of said river when you first knew the same, mentioning that part of its course which had a navigable capacity, and what portions of the year it was navigable, naming the months or parts of months, according to your best recollection.

A. The river was navigable as high up as Roma, in Starr County, about 15 or 20 miles above Rio Grande City, but I doubt of the boats that I have spoken of went above Brownsville earlier than May or later than the early part of November, and I can not say that they plied between Brownsville and the mouth all the year, as my recollection does not recall any fact other than it was late in the fall when I went on the "Grampus" to Indianola.

Interrogatory 5. Q. State from your personal observation or experience, or both, whether since your first knowledge, if you have any, any change has occurred in the navigable capacity of said river, and, as nearly as you can, the year when such change became observable, the nature of such change, if any, its extent, and any circumstances which from time to time occurred to impress such change upon your mind.

A. I can not say of my own knowledge whether the navigation capacity of the river has decreased, not having seen it where it was
478 formerly navigable since 1859, except, as stated, in 1874 at Rio Grande City. I know, however, that there is not as much water flowing in the river now at Laredo in the winter time as in former years; in other words, there has been a perceptible decrease in the volume of water during the past few years at Laredo. In the winter of 1887, being interested in the water works at Laredo, I buried a 12-inch suction pipe on the margin of the river, about eight inches below low water and extending up the river about 875 feet, and about three or four years ago attention was called to the fact that the pipe was becoming exposed, and now, November 30th, the water does not cover the pipe, but washes up and strikes it an inch or two from the top.

Interrogatory 6. Q. State what, if anything, you know by personal observation of the character of the streams which flow into the Rio Grande between its mouth, at the Gulf of Mexico and the city of El Paso, Texas; as to the color of the waters of the same, if they have any

peculiar colors; the extent of the waters they contribute to the Rio Grande; the time of the year when each is accustomed to furnish the greatest volume, and any other facts or circumstances within your personal knowledge affecting the navigable capacity of the river.

A. I have no knowledge, of my own observation, on this point. I only know that the water has different colors at different times at Laredo, but can not say from my own knowledge from what streams these different colored waters come. Formerly the water in the river began to rise *in the river* at Laredo in the early part of April, the natural color of the water changing to a reddish clay. The river then remained muddy until near December, varying in color at different times during this period. From December the river would gradually lose volume until it reached its minimum low water, in March or early April. Until the last two years I never saw the Rio Grande flowing clear water at Laredo as late as May and June. This year there was no rise in the river until about June 17th.

479 Interrogatory 7. Q. State what, if anything, you know of the color, nature, and extent of the water of the Rio Grande at and above El Paso, Texas, and in this connection state what you know, or have know' fro' year to year, since your knowledge began, of the effect of the flood waters, or so-called torrential flow, as to the time of the year when the same became manifest in navigation, and also state the same of the ordinary flow of waters, or so-called perennial flow—all of this, as far as your knowledge will permit, as to waters coming from and above El Paso.

A. I know nothing.

Interrogatory 8. Q. State what you know, from personal observation, of the character of the bed of the said stream as to hollows and depressions; as to whether the same or any part is porous and capable of rapid absorption of water; as to sloughs or bayous, and arroyos, so-called, or any other features, outside of evaporation, which would have a tendency to detract from navigable capacity during a low state of water, and required *as* to be filled before water coming down stream could be useful in tending to raise the river to a navigable height.

A. The banks of the river at Laredo are 60 feet above the bed of the river; that is the general level of the valley here; it is as high or higher at the coal mines, 25 miles above here. It is not less 45 feet at San Ignacio, 42 miles below, and, I judge, about 30 or 35 feet at Roma. I do not think that there are any considerable sloughs or bayous; at least, I never saw any between the points I have given. The bed of the streams is rock from the mines to Carrizo, and my recollection is that it is very rocky at Roma, but I may be mistaken. I don't think there is rock at Rio Grande City. The rock is very close-grained and very little water percolates through it; this is my experience from digging a well on the margin of the river.

Interrogatory 9. Q. State whether, within your knowledge of the river, there have been any changes in cutting timber along the stream,
480 or of any other nature than the diversion of the water for mining and irrigation purposes, tending to impair or reduce the navigability of the stream in that part of the same where it was navigable when you first knew it.

A. I do not know.

Interrogatory 10. Q. State whether from your experience and knowledge of the said river, the construction of a dam, and the storage or impounding of any considerable quantity of water, and the diversion of the same for manufacturing purposes at a point across the same about 125 miles above El Paso, Texas, in the Territory of New Mexico, would have any influence upon the navigability of said river where it is now navigable; and if any, what that influence would be? Of this state fully, giving reasons.

A. I don't know.

Interrogatory under Rule XXXIX. Q. Do you know or can you set forth any other matter or thing which may be of benefit or advantage to the parties at issue in this cause, or either of them, or that may be material to the subject of this your examination of the matters in question in this cause? If yes, set forth the same fully and at large in your answer.

A. I refer to you my answers to the 5th and 6th direct interrogatories.

481 And the cross-interrogatories propounded to the said witness at the time of the taking of the said deposition aforesaid, and his answers to the same, were thereupon read in evidence as follows, that is to say:

1. Q. How long have you resided at the place of residence named by you, and how long have you been engaged in the business named by you in your direct examination? Where and at what place have you resided other than at the places so named by you, and from what time to what time at each of such places, and what other occupations have you been engaged in, and from what time to what time have you been so engaged in the same?

A. Lived in Laredo, 25 years; practicing law, 27 years; lived in San Antonio, Texas, from 1859 to 1866; in New Orleans, 2 years; in San Antonio again until 1874, and since then in Laredo. I though school in San Antonio two years. I have no other occupation.

2. Q. Are either of you now, or have you been, in the employ of the United States, in any capacity, or have you worked for, or been in the employ of, the International Boundary Commission between Mexico and the United States; and if so, in what capacity?

A. No.

3. Q. If, in answer to direct interrogatory number two, you undertake to state how long you have had personal observation of the Rio Grande and over what part of it your personal observation has extended, please state how much of this river you have ever been over, and give the highest point on it you were ever on in person, and how often you

482 have been to such point in person.

A. I have answered fully; I refer you to my answers to direct interrogatories.

4. Q. If you have stated that you have been on the Rio Grande and given the highest point at which you have been, please state whether you have traveled over the intermediate points between such highest point and Brownsville, Texas, in person; and if so, please state what intermediate points you have traveled over, and how often you have been over

such intermediate points or any particular one of the same, describing such point.

A. I have traveled over the points stated by me in person as already stated.

5. Q. If you have stated that you have had personal observation of any portion of the Rio Grande, please give the length in miles, measuring by the course of the river, that you have had personal observation over, and the length of the same measured in a direct line between the highest point and the lowest point which has been covered by your observation.

A. I can not give the distance measured by the course of the river. I judge the distance from Brownsville to the mouth of the river to be about twenty-five miles by land. From Rio Grande City to the coal mines 145 miles by land.

6. Q. If you have stated that you have had personal observation of any portion of said river, please name the tributaries which said river has on that portion of it covered by your observation, and also,
483 please state the distance from tributary to tributary, coming up the river, and whether such tributaries come in on the American or Mexican side of the river.

A. I only know the San Juan at Camargo and the Salado at Guerrero on the Mexican side. I only know dry arroyos on the American side.

7. Q. If you have named any tributaries which come into the Rio Grande, or have stated that you know of any tributaries that come into the same, please state all the facts which you know with reference to such tributaries, and state where they rise, how long they flow, whether the valleys of such tributaries are settled or unsettled, whether the waters of such tributaries are used for irrigation or mining purposes, how such tributaries are used for irrigation or mining purposes, how much land is cultivated on each tributary, and whether the waters of such tributary are used for irrigation or mining purposes.

A. I have no knowledge of the matters inquired about.

8. Q. If you have stated that any of the waters of the tributaries of the Rio Grande are used for irrigation or mining purposes, please state how much of the same, and how long they have been so used, and state how much land is cultivated on each tributary by means of the water of the same, and what portion of the waters of such tributaries are used for irrigation or mining purposes.

A. I have no knowledge of the matters inquired about.

484 9. Q. If you have stated that any part of the water of such tributaries so flowing into the Rio Grande is used for irrigation or mining purposes, please state at what point on the same the waters are diverted from the streams for such purposes, and whether more or less water is now used on each of such tributaries—naming them—than was formerly used; and if so, when the increase or decrease in such use commenced and when it reached its maximum.

A. I have no knowledge of the matters inquired about.

10. Q. If you have stated that you know of any of the tributaries of the Rio Grande, please state whether any dams or reservoirs are on any such streams, naming them; and if there are, where the same are situated, and in or across what streams they are constructed, and when they

were constructed, and whether any of the same were constructed by authority of the Mexican Government or by its permission, if you know.

A. I have no knowledge of the matters inquired about.

11. Q. If you have stated that you are acquainted with any of such tributaries of the Rio Grande, please state whether the flow of the same was or is constant or whether the same is spasmodic or intermittent, describing in detail in this respect each particular tributary, and also state whether such streams are known as flood streams or perennial streams, and at what seasons of the year their floods generally come, if they are flood streams, or if large floods come down the same, and how long such floods last, and what becomes of such floods.

A. I have no knowledge of the matters inquired about.

12. Q. If you have stated anything with reference to the navigation of the Rio Grande, please state the highest point on such river to which permanent navigation has ever extended.

A. I have answered fully all I know on this point in my answers to direct interrogatories. I do not mean to affirm that there was permanent—that is to say, uninterrupted—navigation of the river between Brownsville and the mouth. My recollection on this point is too distinct.

13. Q. If you have stated that you know anything with reference to the navigation of the Rio Grande, please state how many boats were ever used and employed in such permanent navigation, and how many are now used in the same, and what was the size and capacity of each of said boat or boats, and how much water each thereof drew, and how often such boats ascended or descended such river during each year, and during what months during the year they made their ascents and descents.

A. Two boats up to 1899; don't know how many now, if any. They appeared to me as large boats, as I had never seen others. Don't know their capacity or how much water they drew. I am under the impression they ascended the river once a month, from about May to November, but

I may be mistaken about this.

14. Q. If you have stated anything about any boats that navigated the Rio Grande at any time, please state whether such boats made their trips on such river on schedule time, and whether there were particular days of departure which were adhered to, or whether the trips were only occasional, intermittent, and without knowledge on the part of the public or boatmen as to when the boats would arrive at or depart from terminal or intermediate points at which they touched.

A. I can not say. The matters referred to occurred so many years ago, and when I was only about ten years of age, that if I ever knew I have now forgotten.

15. Q. If you have stated that there ever was any navigation on the Rio Grande or is any navigation on it now, please state to what extent the points and people along said river depended upon such navigation for commercial purposes in the past, and to what extent they depend on the same at present, and as to whether they did in the past or do now depend mostly on such navigation, or do they depend mostly upon freighting to and from railroads and commercial centers.

A. The boats carried freight. I don't remember ever seeing carts or wagons being loaded at Brownsville with freight in those days. Freight

to Roma and Rio Grande City is now carried to Laredo and Hebbronville in ox carts. I can not say from my knowledge whether any boats navigated the river after I left Brownsville.

16. Q. Please state how long, in recent years, it would usually take a boat to ascend the Rio Grande from Brownsville, Texas, to Rio Grande City, and give the distance between Brownsville and Rio Grande City, when measured by the course of the river, and also the distance between said points along the usual traveled wagon road between the same.

A. I can not say how long; do not know the meanderings of the river. The distance by this road is about 130 miles.

487 17. Q. Have you not personally observed hulls or wrecks of old boats inside the bar at the mouth of the Rio Grande and up the course thereof and some distance therefrom?

A. I saw one sunken boat at Brownsville when I was about 5 years old. I remember it because I fell off of it and was taken out nearly drowned.

18. Q. If you have said you observed any hulls or wrecks of old boats, as interrogated about, please state how these boats got there and how far up the river their wrecks were observed by you, and state, if you know, how they came to be wrecked and when they were wrecked.

A. I don't know, only that it was at Brownsville.

19. Q. As a matter of fact, is it not true that such boats got into the river over the bar at the mouth thereof? And is it not a fact that many of them were cut in two in order to get them over the bar, and were afterwards abandoned by the parties undertaking to use them? And if "yes," state how long ago this occurred, and the reason, if you know, why the boats were so abandoned.

A. I do not know.

20. Q. If you have stated that you know anything of the character of such navigation, state whether or not vessels can come in from the Gulf of Mexico to the mouth of the Rio Grande at the present time, and how far up the river they can come from such Gulf. If 488 you say they can not come into the mouth of such river or up the same, please state what prevents them from so doing.

A. I do not know.

21. Q. Is there not an obstruction at the mouth of the river Rio Grande which prevents boats from going into the same from the Gulf of Mexico; and if so, what is such obstruction?

A. I do not know.

22. Q. Do you know how much fall there is in the course of the river from Ringgold Barracks to the Gulf of Mexico, per mile?

A. I do not know.

23. Q. What is the character of the current of the river Rio Grande immediately above its entrance into the Gulf of Mexico?

A. I do not know.

24. Q. Has the Rio Grande for several miles from the mouth of the same any appreciable current?

A. There was a current at Brownsville, but I do not think it was strong at low water; I remember being carried away in a skiff by the current; I thought it was powerful then.

25. Q. How far up the course of the river Rio Grande do the tides of the Gulf of Mexico affect the depth of the water in the river, and at what season of the year are these tides heaviest; and when at their heaviest how far up the river do they affect the current of the same?

A. I do not know.

26. Q. In describing the character of the navigation which you testified with reference to, please state what the average depth of the water near Brownsville is during the period when it is usually deepest, and how far up the river the depth continues the same?

A. I do not know.

27. Q. At what period of the year is the depth of the river Rio Grande at Brownsville the greatest, and at what period is it the shallowest, and for how long does the depth continue at its maximum and how long does it continue at its minimum?

A. Deepest in June, July, August, September, and October; constantly varying in depth. It is lowest from January to first of April, diminishing in volume constantly until the spring rise in April.

28. Q. How shallow does the water get in the river at Brownsville?

A. I do not remember.

29. Q. What character of bed has the river Rio Grande, and is the bed of the same permanent or is it shifting? Is it rocky or is it sandy? Are there any shallows in it or any sand banks in it?

A. From Rio Grande City down I think it is shifting and sandy; there are shallows between the coal mines and Rio Grande City, and sand banks from the latter place to the mouth.

30. Q. If you have stated that there are either shallows or sand banks in the bed of the Rio Grande River, please state whether the same are below Rio Grande City, and if they are, if they are sufficient to in any way impede the navigation of the river, and if they are, for how long do they impede navigation?

A. The sand banks impair navigation; because I remember seeing the "Grampus" and the "Ranchero" stuck once or twice each on them.

31. Q. If you have stated what the condition of the bed or depth of the Rio Grande River is, please state how long such conditions have maintained within your knowledge.

A. The conditions were the same as stated as long as I knew the different localities of the river.

32. Q. Was there ever, at any time within your knowledge, any great permanency to the channel of the Rio Grande River, so far as depth and course are concerned, or was the depth and course of the same constantly changing?

A. I have never observed any change in the banks of the river, but the channel within these banks below Rio Grande City constantly vary with the deposit of sand and silt brought down with each rise.

33. Q. What effect, so far as changing the banks and the bed of the Rio Grande, would the heavy floods which came down the river have?

A. At Rio Grande City in 1874 the river had receded from opposite the court-house making a bend away from the court-house. I was told the river was a mile from its former bed near the court-house. That is the extent of my own observation of its effects on the banks. The

banks at Brownsville often caved in, but I never knew it to impair the levee. I do not know of any damage done to the banks above Roma. Last June the river raised at Laredo 30 feet without injuring the banks of the river.

34. Q. How often during a trip up or down the river did the boat or boats which navigated the same, ground upon these sand bars or shallows?

491 A. Frequently, I believe.

35. Q. Did any one of you ever navigate the river Rio Grande on the steamer known as the "San Ramon," or a steamer bearing that character of name? If so, was that the correct name of such steamer, and if not, please give its correct name.

A. No; I don't know. I think I have heard the "San Roman," but not "Ramon." San Roman was a business man in Brownsville.

36. Q. If any of you have said that you have navigated the Rio Grande River in the steamer referred to in the last preceding interrogatory, state whether any of you have any personal recollection of a trip that such steamer made in the first half of the year 1873, when it took 42 days or thereabouts to go from Brownsville to Rio Grande City; and if so, state what caused it to take such length of time, and how long it took such boat to go back down the river from Rio Grande City to Brownsville? And, if you state that it only required a few hours or a short time to do so, please state why such steamer was enabled to go back down the river more rapidly.

A. I do not know, but can guess what made her get back so quickly.

37. Q. Do you remember that on the trip referred to in the last interrogatory, after said boat reached Rio Grande City, a flood came down the river and furnished sufficient water to float the boat back down the stream without touching on the bars or shallows?

A. No doubt of it.

492 38. Q. In describing the navigation of the Rio Grande, please state whether the same was in the past ever a financial success, and if so, during what period it was financially successful, and whether, during the period it was so successful, the navigation of the river was aided by either the Government of the United States or the Government of the Republic of Mexico?

A. All that I know is that Captain Milfin Kennedy and Richard King died millionaires. They had large cattle ranches.

39. Q. Please state whether or not the navigation of the Rio Grande River at the present time is successful or otherwise.

A. All I know is from hearsay.

40. Q. Please state what the ruling price per hundred pounds and also per ton has been in the past, within your knowledge, for transportation between Brownsville and Rio Grande City, when carried by boat, and what the ruling price, per hundred pounds and per ton, river freight now brings on the steamboat "Bessie," between such points, and state whether there is any other steamboat plying the said river at the present time besides the "Bessie."

A. All I know is from hearsay.

41. Q. In connection with the shipment of freight up and down the river Rio Grande, state whether there are any railroads which where built

493 along the same for any distance, on either the Mexican or American side, or which compete with the steamer "Bessie," and on which side of the river such railroads are built, and the termini of the same, and when the same were completed, and for what commercial purpose the same were built.

A. All I know is from hearsay.

42. Q. Please state where the goods and supplies that are shipped over any such railroad for the Rio Grande country are delivered to the road?

A. All I know is from hearsay.

43. Q. Before this railroad was built what method was there of getting shipments of freight into Rio Grande City from distant points other than by navigation from Brownsville, and what was the cost per hundred pounds or per ton of getting such shipments by such means?

A. All I know is from hearsay.

44. Q. Before such railroad was built were not the rates for river freight greatly in excess of the rates put into effect by such railroad, and which now obtain on points along the Rio Grande River, and is not freight on goods and supplies shipped over the railroad and by boat to points along the river Rio Grande now very much less than before such railroads were built? If so, was not the reduction in such freight rates caused by the construction of such railroad, and did not the construction of such railroad thereby cause the declining in the navigation
494 of the river Rio Grande?

A. All I know is from hearsay.

45. Q. Could the navigation of the river from Brownsville up the stream be carried on after the construction of such railroad so as to successfully compete with the same in their freight rates between their termini and intermediate points along such river, and is not the decline of navigation on said river due to the inability of boats to compete with freight rates put in effect by such railroad?

A. All I know is from hearsay.

46. Q. Do you know the location of Comargo; and if so, how long have you known it, and was there ever any considerable amount of freight ascended such river on boats to Comargo to such point?

A. First saw Comargo in 1874; once only, for a day or two.

47a. Q. Was not Comargo a center for the supplying of interior points of Mexico, even at great distance away therefrom? If it was, at what distance? Please state what sized place Comargo is now and what size place it was prior to the building of such road; and if it is a place of less size now. Please state if it is not also of less commercial importance than formerly. State, if you know, what has caused the decline of Comargo in population and commercial importance.

495 A. All I know is from hearsay. I know, however, that Comargo is no commercial importance now.

47b. Q. Was not this decline of Comargo due to the construction of the Mexican International Railroad, running between Laredo and the interior points of Mexico, and connecting at Laredo with points in the United States? Does not such railroad now supply the interior points of Mexico which formerly contributed to the commercial importance of Comargo, at cheaper rates of freight than could be had by navigation of the river.

A. (No answer to this cross-interrogatory.)

48. Q. If you have stated that any change has occurred in the commercial capacity of the Rio Grande River, and have undertaken to state the nature of such change, please state whether such statements made were all founded upon personal observations made by you or are partly or wholly suppositions or theories.

A. I have tried to state only what I think is the fact, as observed by myself, conclusions from my recollection, and facts also from which you can draw your own conclusions. I have endeavored to not state as facts within my own knowledge or experience matters of general notoriety to people in this section.

49. Q. If you have undertaken to state that there are any changes in the navigable capacity of the Rio Grande River, please state what the effects of such changes were in the increase or decrease of the flow of the river at Brownsville. How much depth, more or less, did the
496 river take on at Brownsville and what was the effect? How much depth was there, more or less, at intermediate points between Brownsville and Ringgold Barracks, naming each place of prominence at which the water became deeper or shallower? At what point did you observe this effect? How often during the year when such effect was worked did you observe the same? How long did such effect continue?

A. I have said all I know about the matters inquired about.

50. Q. Do you know whether in the year when such effect was first observable, or within a year or so before the same was observable, there was any use commenced of any of the waters of any of the tributaries of the Rio Grande for purposes of irrigation or otherwise? If so, to what extent were such waters of such tributaries used?

A. I have said all I know about the matters inquired about.

51. Q. Did you know where the San Juan River empties into the Rio Grande? Does it come from the American or Mexican side? What was the amount of water contributed by the San Juan to the Rio Grande when you first knew the Rio Grande—was it a considerable stream or an insignificant one? State how wide it was and about how deep, and about the rapidity of its current where it emptied into the Rio Grande, if you know.

A. I have said all I know about the matters inquired about.

52. Q. If you have stated that there was any change in the navigable capacity of the Rio Grande, commencing at any period named by you, state whether during the year of such change or subsequent
497 thereto, the flow of said San Juan River was more or less than it has been in past years. And is the flow of such San Juan River more or less now than it was when you first became acquainted with the Rio Grande? If so, to what extent has it increased or decreased? State, if you know, the cause of such increase or decrease. Are its waters now used for irrigation at any point on its course?

A. I have said all I know about the matters inquired about.

53. Q. Please state if, before any change which you may have referred to in the navigability of the Rio Grande took place, you were acquainted with the amount of water flowing into the Rio Grande from the Salado, the San Antonio, the San Rodriguez, the Santiago, the San Philippe, Devil's River, Goodenough, the Pecos, and the Concho. If so, state where each of those rivers or any one thereof, with which you may be

acquainted, comes into the Rio Grande, with reference to the location of Rio Grande City, that is, the number of miles above such city the mouth of such rivers are. State about what was the size of each of those streams, the depth, width, and velocity of current at the point where the same entered into the Rio Grande. Please state which ones of said rivers were larger and which smaller than the others, also whether there had been any decrease, at the time of any change in the navigability of the Rio Grande occurred, in the flow of either of such streams. If so, which decreased in its flow from the time when you first knew the same up to the time when the navigable capacity of the Rio Grande underwent any change?

A. I have said all I know about the matters inquired about.

54. Q. As a matter of fact, were you ever personally at the mouth of any of these streams? If so, please name the same and state when and often you were there previous to such change in the navigable capacity of the Rio Grande; also how often you have been there subsequent to such change in its navigable capacity.

498 A. I have said all I know about the matters inquired about.

55. Q. If in answer to the foregoing question, you should state that there has been any decrease or increase in the amount of water flowing in any of the tributaries above named, since the time when you first knew the same, please state, if you know, what has caused such increase or decrease.

A. I have said all I know about the matters inquired about.

56. Q. Do you know that the flow of such tributaries and of the Rio Grande varies any changes in accordance with the amount of rainfall which occurs from year to year over the watershed drained by such Rio Grande and its tributaries?

A. I know that the flow of the Salado and the Rio Grande varies and changes with the rainfall.

57. Q. Do you not know that for a great many years past the rainfall in the watersheds adjacent to the Rio Grande and these tributaries in that section of Texas and Mexico has decreased and is now less than it was in the years immediately preceding 1887 and 1888?

A. No; I do not know it. I would neither deny it nor affirm it, and would only believe it when the data and statistics concerning rainfall could be shown to be more generally and accurately kept and compiled than they have been heretofore. I know that in this section there was a severe drought causing the death of many cattle and distress to the poor from about 1892-3-4. I also know that more rain has fallen during the two years past than I ever experienced, and still I can not compare it with the rainfall in this section prior to 1887, because I doubt if the garrison posts kept a record prior to 1887. If they did, it is easy to obtain it from the Government, and such evidence will not be disputed.

58. Q. As matter of fact, has there not been a drouth in that section of the country since in the eighties, and has not this drouth resulted in the death of the greater portion of cattle and sheep, and even during periods necessitated the removal of portions of the population in various places along the river?

(Answer to cross-interrogatory 58th combined with 59.)

59. As matter of fact, is there now one-half as much rainfall as there was in that section of country in such former years?

To the 58th and 59th cross-interrogatories, he says: No; it is a powerful dry country, but no 20 years' drought has struck it yet. That would be worse than Joseph's experience in Egypt. The Rio Grande is in the arid belt or dry zone. Guyot's Physical Geography describes the climate and characteristics of the rainfall of this section very accurately.

60. Q. If, in answer to the sixth direct interrogatory you state that you know anything by personal observation as to the colors of the water of any stream which flows into the Rio Grande between its mouth at the Gulf of Mexico and the city of El Paso, Texas, please state how you know the same.

A. I am not informed upon the subjects inquired about.

61. Q. At what points above the head of navigation did you ever observe personally the colors of the waters of any such tributary, and how many times did you ever observe the color of such water above the head of navigation?

A. I am not informed upon the subjects inquired about.

500 62. Q. If, in answering interrogatory number six, you have stated that you knew the color of any water, did you answer from having seen the same during your navigation of the river and after such water had mingled with the waters of such stream where navigable, or did you get your idea of the color from having seen it come out of the tributary before it had entered the Rio Grande?

A. I am not informed upon the subjects inquired about.

63. Q. Can you tell the color of the water of each of the following tributaries, respectively: San Juan, Salado, San Antonio, San Rodriguez, Santiago, San Philipe, Devil's River, Pecos, and Concho? If so, please state the color of each one separately.

A. I am not informed upon the subjects inquired about.

64. Q. What is the difference between the color of the Pecos and of the Concho? What is the difference between the color of the Concho and of the Rio Grande before the Concho empties into it?

A. I am not informed upon the subjects inquired about.

501 65. Q. If you undertake to tell the color of each one of these tributaries, state how you know the same and whether your statement is derived from hearsay or from actual observation.

A. I am not informed upon the subjects inquired about.

66. Q. Were you ever at El Paso, Texas? If so, when and how often? Did you ever see the Rio Grande at such place? If so, what was the color of the Rio Grande at that place?

A. I am not informed upon the subject inquired about.

67. Q. Do you know that the color of any tributary of this stream is liable to vary and change greatly from time to time, in accordance with the droughts, the light floods, or the excessive floods, or even the particular dry arroyos through which such floods from time to time enter such tributaries?

A. I am not informed upon the subject inquired about.

68. Q. Do you know of a heavy rainfall comes upon any particularly timbered section of a watershed of one of these tributaries, making a flood in the tributary itself, that the color is liable to be very greatly different from the color of a flood in such tributary caused by an excessive rainfall in the nontimbered parts of the watershed of such tributary?

A. I am not informed about the subject inquired about.

502 69. Q. If you say that you know the color of the floods of the Pecos River which empty into the Rio Grande, please state whether in recent years there has been any change in the color of the Pecos floods?

A. I am not informed upon the subject inquired about.

70. Q. Witness Kelly is asked whether he is the same man who made an affidavit to be used in the trial of the injunction which was granted in this case in 1896 or 1897, and whether it is true that he therein stated that he had not observed or heard remarked on the river any reference to waters which, from their color, appeared to come from the Upper Rio Grande itself since in the early eighties. In this connection, said witness is asked to state when he last observed flood waters, while on the navigable part of the Rio Grande, which, from its color, he judged to come from the Upper Rio Grande.

A. I am not informed upon the subject inquired about.

71. Q. If it is true that Witness Kelley has not observed any flood waters on the navigable portion of the Rio Grande which from their color he judged to come from the Upper Rio Grande, then is it not true, according to his observation, that the flood waters of the Rio Grande have not contributed materially to the navigation of that stream since in the early eighties?

A. I am not informed upon the subject inquired about.

503 72. Q. For how long a period during each year, and at what time of the year, is the amount of the water in the Rio Grande, in its navigable parts, substantially increased by flood flows coming in from its tributaries?

A. I am not informed upon the subject inquired about.

73. Q. During such period, to what extent is that navigable depth of the Rio Grande increased, and how much is such stream widened?

A. I am not informed upon the subject inquired about.

74. Q. When such floods come, are the waters confined within the banks, or do such floods rise over the banks of the Rio Grande, and deposit waters in lagoons, lakes, and depressions?

A. I am not informed upon the subject inquired about.

75. Q. What portion of any particular flood, which may in a week or ten days pass Ringgold Barracks, will reach Brownsville? Does the amount of water which will reach Brownsville from such flood, lasting, say, a week at the head of navigation, constantly decrease as it comes down the channel and deposit itself in such bayous and lakes, or is it absorbed by the sand?

A. I am not informed upon the subject inquired about.

504 76. Q. Have you any knowledge or information as to how far below El Paso water will run in the channel of the river before it is absorbed and taken up by the sand, when, for five days or ten days or thirty days, at El Paso, such water ran one foot deep and fifty feet wide, or when it ran at any other particular depth or width for any given period of time, at El Paso?

A. I am not informed upon the subject inquired about.

77. Q. Do you know what would be the effect of a flood at El Paso, Texas, which ran a thousand cubic feet per second for one day, or ten days,

or twenty days, or thirty days, so far as increasing the depth and velocity of water in the river at Fort Quitman, Presidio del Norte, or the mouth of the Pecos, or Eagle Pass, or Rio Grande City, or Brownsville is concerned?

A. I am not informed upon the subject inquired about.

78. Q. Do you know how much the river would be raised at Rio Grande City by a flood passing El Paso, Texas, amounting to 15,000 cubic feet of water per second, and running for ten days at that rate?

A. I am not informed upon the subject inquired about.

79. Q. Do you know in the month of May, 1897, whether any flood entered the Rio Grande from either the San Juan, Salado, San Antonio, the San Rodriguez, Santiago, San Philipe, Devil's River, Pecos, or the Concho? If you , which one of these streams do you know of any flood entering the Rio Grande from during that month?

A. I am not informed upon the subject inquired about.

80. Q. Have you any knowledge as to whether any flood came
505 from either one of those tributaries into the Rio Grande during that month? Please state which one of them you do not know with reference to.

A. I am not informed upon the subject inquired about.

81. Q. Do you know whether there was a flood from either one of those streams entering into Rio Grande during the present calendar year? If so, which one of them had a flood, and what month did the same occur in? If you do not know with reference to any one of the same during the present year, please state which one you do not know with reference to.

A. I am not informed upon the subject inquired about.

82. Q. In interrogatory seven you are asked to state your full knowledge of the effect of the ordinary flow of water and of the flood waters which come from above El Paso. As a matter of fact, have you had any personal observation which will enable you to state just what regular flow or flood flow comes from El Paso, or above there, or are you simply depending upon hearsay as to that?

A. I am not informed upon the subject inquired about.

83. Q. Do you know anything about the amount of waters which have flowed regularly by El Paso since 1880 or previous thereto?

A. I am not informed upon the subject inquired about.

84. Q. What was the width and the depth of the water flowing in the Rio Grande passed El Paso in 1880? What was it in 1885? What was it in 1890? What was it in 1895? What was it in 1899?

506 A. I am not informed upon the subject inquired about.

85. Q. Do you know during what years between those dates, or previous to those dates, the river has been absolutely dry at El Paso for any considerable number of months in the year; and if so, what months?

A. I am not informed upon the subject inquired about.

86. Q. Do you know what flood flows passed El Paso in the years above named? Do you know how long the flood of 1897 at El Paso lasted?

A. I am not informed upon the subject inquired about.

87. Q. If you have testified as to any flood flows passing by El Paso

during any of those years, state whether you were at El Paso and saw them, or whether you were simply guessing that they passed El Paso, because you saw them at some point further down the river.

A. I am not informed upon the subject inquired about.

88. Q. If you saw any floods down the river at any navigable part thereof, during any of those years, is it not possible that they may have come from some of the tributaries of the Rio Grande above named?

A. I am not informed upon the subject inquired about.

89. Q. Is it not possible that such floods may have come from heavy rains along the Rio Grande below El Paso?

507 A. I am not informed upon the subject inquired about.

90. Q. How far above El Paso were you ever? Did you ever come up the Rio Grande from the head of navigation to El Paso overland and observe the flow of the Rio Grande along its entire course?

A. I am not informed upon the subject inquired about.

91. Q. If, in answer to interrogatory eight, you state that you have personally observed the bed of the said Rio Grande as to hollows of depressions, and that the same is porous and capable of large absorption, or that the same has sloughs or bayous and arroyos which have a naturally tendency to detract from its navigable capacity during a low stage of water, and which have to be filled before the river can be raised by floods and increased flows, please state what ultimately becomes of the water which is consumed by such porous character of soil or which runs into such sloughs or bayous or arroyos.

A. I am not informed upon the subject inquired about.

92. Q. Does this water stand in such sloughs and bayous until it is absorbed by the soil or by evaporation?

A. I am not informed upon the subject inquired about.

508 93. Q. If you state that you have observed such sloughs and bayous state how far up the river you have observed the same, and whether, practically, the same condition does not continue up the stream to El Paso and north of that place.

A. I am not informed upon the subject inquired about.

94. Q. If you state that such sloughs and bayous check and hold this waters and such waters sink into the sand and are absorbed, please state if these facts would not tend to constantly decrease any floods which might pass El Paso and so decrease the same as to practically consume it so that it would not substantially aid navigation where said river is navigable.

A. I am not informed upon the subject inquired about.

95. Q. If, in answer to interrogatory eight, you state that the flood waters of the river are necessary to fill bayous and depressions in order to keep the regular current flowing down, then please state whether, in your opinion, that result is the greatest good produced by these floods. As matter of fact, the floods are treacherous, are they not?

A. I am not informed about the subject inquired about.

509 96. Q. Are you acquainted with the steamer "Bessie," and if so, what relation towards it do any of you bear? Can the steamer "Bessie" come up the Rio Grande against the flood coming down the stream with any considerable force?

A. I am not informed upon the subject inquired about.

97. Q. It is a fact, is it not, that it is exceedingly trying and dangerous to the safety of the vessel and the progress of the same to undertake to navigate the river depending upon the flood flow?

A. I am not informed upon the subject inquired about.

98. Q. It is true, is it not, that if a steamer comes up the Rio Grande during a flood, it is exceedingly liable to be stranded by reason of the subsidence of the flood before the steamer reaches its destination?

A. I am not informed upon the subject inquired about.

99. Q. Can the steamer "Bessie" come up the Rio Grande at all during the heaviest flood flows which occur along its navigable course? Is it not true that she can better navigate when the floods are not greatest, and that if the excessive floods were lessened she would make quicker and safer trips?

A. I am not informed upon the subject inquired about.

510 100. Q. How many irrigating ditches do you know of from the vicinity of El Paso to Brownsville, Texas? If any, where are the same located and how much of the Rio Grande do they divert, and on which of the river are they, on the American or Mexican side?

A. I am not informed upon the subject inquired about.

101. Q. In direct interrogatory tenth, you are asked what would be the effect of storing water 125 miles above El Paso, Texas, so far as navigability of said river is concerned. Do you know a point named as Elephant Butte, about 125 miles above El Paso, Texas? Were you ever at such point? Do you know whether the bed of the proposed reservoir at Elephant Butte is sandy, or whether the river at that point flows through a rocky cañon? When were you there?

A. I am not informed upon the subject inquired about.

102. Q. Do you know the character of the bed of such stream below Elephant Butte down to a point of rocks just above Las Cruces, New Mexico? What is the character of the bed of such stream at such point?

A. I am not informed upon the subject inquired about.

103. Q. Have you ever been connected with an irrigation company or had any experience in the use of waters of reservoirs? If so, where and what experience have you had? How large was the reservoir with which you had such experience?

A. I am not informed upon the subject inquired about.

511 104. Q. Do you know what per cent of the waters which would be impounded by a dam thrown across the river 125 miles above El Paso, Texas, would pass off by evaporation?

(Combined with answer to 105.)

105. Q. Suppose such dam held water fifty feet deep, ten miles long, and a mile wide, what amount in depth of such water in such place would pass off by evaporation, and how do you know that?

A. To cross-interrogatories 104 and 105 he says: About one-eighth inch per day in depth. By experience in this climate and by study. The depth of fifty will greatly lessen evaporation as compared with one of less depth.

106. Q. Do you know how much such water, when being let out of such dam and used in the neighborhood thereof for irrigation without being taken out of the valley of the Rio Grande, would return to the Rio Grande and contribute to its flow? If so, what per cent would so return?

What would become of the balance of the water? What part would pass off in vegetation? What per cent of what is lost would be due to absorption?

A. The greater part would eventually return by percolation to the bed of the river—the lowest level of the valley; nothing is wasted.

107. Q. What would be the effect upon the flow of the river at its navigable parts if the water of the stream so impounded at this point, 125 miles above El Paso, and used, as is asked in direct interrogatory tenth, for manufacturing purposes, and let back into the river into such quantities as would be sufficient to supply all ordinary manufacturing purposes which might be located thereunder?

(Combined with answer to 108.)

512 108. Q. As matter of fact, have you sufficient technical knowledge to be certain what the effect of impounding the waters of the Rio Grande 125 miles above El Paso and using them along the banks of the stream for irrigation, would have upon the flow? Do you not know it to be a fact that such acts would tend to equalize the average flow of such river?

A. To the 107' and 108th cross-interrogatories, he says: It would be beneficial to or increase the volume of water in the river.

109. Q. If 500 cubic feet of water per second were taken out of a reservoir constructed 125 miles above El Paso, how much of it would reach El Paso, and how much of it would be lost in the bed of the river itself by absorption and evaporation?

110. Q. If five hundred feet of water reached El Paso, Texas, traveling down the bed of the stream, after having been turned out of the reservoir 125 miles above El Paso, how much of it would be diverted out of the stream by the Juarez dam at El Paso, and flow off down the Juarez canal on the Mexican side, and how much of it would be diverted by the El Paso wing dam and flow down to El Paso?

111. Q. If you have stated that the flood of waters of the Upper Rio Grande ever reached the lower portion of the river, please state at what season of the year the floods usually come down the river.

513 112. Q. If any of the floods waters from El Paso or above ever come down the Rio Grande, and you have undertaken to state that there are any sloughs, bayous, or arroyos in the bed of the stream, which such flood waters might fill up, or that such flood waters do actually fill up the same, please state when the flood waters fill the same and how long the waters remain therein. State if it is not a fact that even if enough flood waters come down to fill the sloughs, bayous, and depressions in the bed of the Rio Grande, that such flood waters would and do evaporate or disappear before the perennial flow of the Rio Grande comes down the same.

To cross-interrogatories 109th, 110, 111, and 112, he says: I do not know. Yes; only one flood this year at Laredo. That was in June; thirty feet high. The other rises were insignificant. The next highest, nine feet. About June 14th the river began rising and reached its maximum on June 17th, and on the 20th the river was less than eight feet high—that is, above the low-water level.

113. Q. Have not the floods of the Rio Grande at Presidio, Rio Grande City, Laredo, Eagle Pass, and Brownsville been greater during

the present year than they have been for many years previous? If you answer that they have not, please state during what years within the past ten years, and during what month in such years, there have been heavier floods than during the present year. In your answer name each year during the last ten years, and the month or months of each year during which the floods have been greater than they have during the present year at the points mentioned. And state, if you know, that the highest water reached by the river at each of such points during the present year, and the time of such high water, and the highest water at each of said points during the past ten years.

(No answer.)

514 114. Q. With whom have you conversed about giving testimony in this case? Were you asked to come in person at the trial of this case and give your personal evidence, by anyone; and if so, whom? When did you first see or have read to you the interrogatories and cross-interrogatories which have been propounded to you, and who first showed them to you and told you of the same?

A. With W. P. Sutton, who told me he was looking for evidence in this case. He did not ask me to attend court and testify; he knew I could not do so. We had but a few moments' conversation on the street in Laredo, probably a month ago. We have been acquainted since he was here as U. S. consul at New Laredo. These interrogatories were given me by S. T. Foster, the United States commissioner, as I have no time to appear before him during his office hours, the district court being now in session.

115. Q. Have you read over such interrogatories or cross-interrogatories with anyone previous to having the same propounded to you by the officer taking your deposition? If so, with whom did you read over the same?

A. No.

116. Q. Has anyone written out for you or furnished you with a written answer or suggested a written answer which would be suitable to any of the interrogatories or cross-interrogatories which have been submitted to you? If so, who has done so?

117. Q. Has anyone suggested any portions of the answers or any portion of an answer to these interrogatories? If so, whom?

To 116 and 117, he answers: A. No one. I have written the answers myself, after reading each interrogatory, and will take them to the commissioner for him to prepare in a more presentable shape for me to answer to and sign after he has pronounced the interrogatories to me.

515 118. Q. Do you speak English, or have the questions been translated to you? If so, have your replies thereto been translated into English before being written down?

A. Yes; I understand English better than Chaucer, I hope.

119. Q. In whose presence and where and on what day have you given this answer? Name everyone who has been present while you were giving this testimony, listening to the same. Has any attorney been present? If so, give his name and state whether he was the attorney for plaintiff or for the defendant.

A. In the presence of no one other than the commissioner, on this 4th day of December, 1899.

120. Q. Has anyone representing the United States Government, or pretending to so represent it, been present at the taking of this testimony? If so, state his name.

A. No attorneys present, nor anyone representing the Government, other than the commissioner, S. T. Foster.

(Signed)

A. L. McLANE.

516 RAYMOND MARTIN, another witness on behalf of the United States, living at Laredo, Texas, having previously given his testimony by deposition, taken on direct and cross interrogatories, the said deposition was then read in evidence, as follows:

Interrogatory 1. Q. What is your name, age, residence, and occupation?

A. My name is Raymond Martin; age, 71 years; residence, Laredo, Texas; have been a merchant for 35 years, but am now a stock raiser.

Interrogatory 2. Q. When did you first see the Rio Grande, how long have you had personal observation of it, and over what part of it has your personal observation extended? State fully.

A. Since April, 1857, and from that time to the present, but within the limits of Webb County.

Interrogatory 3. Q. State what you know, if anything, by personal experience, if you had any, as well as by personal observation, of the navigation of said river, the character of such navigation, the amount and extent thereof, and the time when such experience and observation began and ceased.

A. I don't know.

Interrogatory 4. Q. State what you know from personal observation and experience, or either, concerning the navigable capacity of said river when you first knew the same, mentioning that part of its course which had a navigable capacity and what portions of the year it was navigable, naming the months or parts of months, according to your best recollection.

517 A. The river here has never been navigable since I have known it.

Interrogatory 5. Q. State from your personal observation or experience, or both, whether since your first knowledge, if you have any, any change has occurred in the navigable capacity of said river, and, as nearly as you can, the year when such change became observable, the nature of such change, if any, its extent, and any circumstances which from time to time occurred to impress such change upon your mind.

A. Not navigable here.

Interrogatory 6. Q. State what, if anything, you know by personal observation of the character of the streams which flow into the Rio Grande between its mouth at the Gulf of Mexico and the city of El Paso, Texas, as to the color of the waters of the same, if they have any peculiar colors, the extent of the waters they contribute to the Rio Grande, the time of the year when each is accustomed to furnish the greatest volume, and any other facts or circumstances within your personal knowledge affecting the navigable capacity of the river.

A. I never saw any streams flowing into the Rio Grande River.

Interrogatory 7. Q. State what, if anything, you know of the color, nature, and extent of the waters of the Rio Grande at and above El

Paso, Texas, and in this connection state what you know, or have known from year to year since your knowledge began, of the effect of the flood waters, or so-called torrential flow, as to the time of the year when the same became manifest in navigation, and also state the same of the ordinary flow of waters, or so-called perennial flow, all of this as far as your knowledge will permit as to waters coming from and above El Paso.

518 A. All I know is that the river at this place has an annual rise, which occurs in the months of May, June, and July.

Interrogatory 8. Q. State what you know from personal observation of the character of bed of the said stream as to hollows or depressions; as to whether the same or any part is porous and capable of rapid absorption of water; as to sloughs or bayous and arroyos, so-called, or any other features outside of evaporation which would have a tendency to detract from the navigable capacity during a low stage of water and required to be filled before water coming down stream could be useful in tending to raise the river to a navigable height.

A. I know nothing of the navigable capacity of the river, it not being navigable here.

Interrogatory 9. Q. State whether within your knowledge of the river there have been any changes in cutting timber along the stream, or of any other nature than the diversion of the water for mining and irrigation purposes, tending to impair or reduce the navigability of the stream in that part of the same where it was navigable when you first knew it.

A. The river here has been decreasing in the volume of water for the last 25 years, but from what cause I do not know; during that time it has decreased at least one-half.

Interrogatory 10. Q. State whether from your experience and knowledge of the said river the construction of a dam and the storage or impounding of any considerable quantity of water and the diversion of the same for manufacturing purposes, at a point across the same about 125 miles above El Paso, Texas, in the Territory of New Mexico,

519 would have any influence upon the navigability of said river where it is now navigable, and, if any, what that influence would be. Of this state fully, giving reasons.

A. There would be less water here, and, in fact, the whole length of the river, but what effect on the navigation of the river I can not say, except, of course, there would be less water.

Interrogatory under Rule XXXIX. Q. Do you know or can you set forth any other matter or thing which may be of benefit or advantage to the parties at issue in this cause, or either of them, or that may be material to the subject of this your examination of the matters in question in this cause? If yes, set forth the same fully and at large in your answer.

(Witness makes no answer.)

520 And the cross-interrogatories propounded to the said witness at the time of the taking of the said deposition aforesaid and his answers to the same were thereupon read in evidence as follows—that is to say:

1. Q. How long have you resided at the place of residence named by you, and how long have you been engaged in the business named by you in your direct examination? Where and at what place have you resided

other than at the places so named by you, and from what time to what time at each of such places, and what other occupations have you been engaged in, and from what time to what time have you been so engaged in the same.

A. I was engaged in business as a merchant here in Laredo from 1854 to 1885. Since that time I have been engaged in the stock raising business up to the present time, and have resided in Laredo and in no other place.

2. Q. Are either of you now or have you been in the employ of the United States in any capacity, or have you worked for or been in the employ of the International Boundary Commission between Mexico and the United States; and if so, in what capacity?

A. No.

3. Q. If, in answer to direct interrogatory number two, you undertake to state how long you have had personal observation of the Rio Grande and over what part of it your personal observation has extended, please state how much of this river you have ever been over, and give the highest point on it you were ever on in person, and how often you have been to such point in person.

A. I have never been up the river and have been only once to Brownsville, and there crossed the river. I have been up from Laredo only about 15 miles and down as far as Carriso.

4. Q. If you have stated that you have been on the Rio Grande and given the highest point at which you have been, please state whether you have traveled over the intermediate points between such highest point and Brownsville, Texas, in person. And if so, please state what intermediate points you have traveled over, and how often you have been over such intermediate points, or any particular one of the same, describing such point.

(No answer.)

5. Q. If you have stated that you have had personal observation of any portion of the Rio Grande, please give the length in miles, measuring by the course of the river, that you have had personal observation over, and the length of the same measured in a direct line between the highest point and the lowest point which has been covered by your observation.

A. I never made any close observation of the river and therefore can not answer.

6. Q. If you have stated that you have had personal observation of any portion of said river, please name the tributaries which said river has on that portion of it covered by your observation, and also please state the distance from tributary to tributary, coming up the river, and whether such tributaries come in on the American or Mexican side of the river.

A. As far as my observation extends, there are no tributaries flowing into the river from either side, except from heavy rains.

7. Q. If you have named any tributaries which come into the Rio Grande, or have stated that you know of any tributaries that come into the same, please state all the facts which you know with reference to such tributaries, and state where they rise, how long they flow, whether the valleys of such tributaries are settled or unsettled, whether the waters of such tributaries are used for irrigation or mining purposes, how such

tributaries are used for irrigation or mining purposes, how much land is cultivated on each tributary, and whether the waters of such tributary are used for irrigation or mining purposes.

8. Q. If you have stated that any of the waters of the tributaries of the Rio Grande are used for irrigation or mining purposes, please state how much of the same and how long they have been so used, and state how much land is cultivated on each tributary by means of the water of the same, and what portion of the waters of such tributaries are used for irrigation or mining purposes.

523 9. Q. If you have stated that any part of the water of such tributaries so flowing into the Rio Grande is used for irrigation or mining purposes, please state at what point on the same the waters are diverted from the streams for such purposes, and whether more or less water is now used on each of such tributaries, naming them, than was formerly used, and if so, when the increase or decrease in such use commenced and when it reached its maximum.

10. Q. If you have stated that you know of any of the tributaries of the Rio Grande, please state whether any dams or reservoirs are on any such streams, naming them, and if there are, where the same are situated, and in or across what streams they are constructed, and when they were constructed, and whether any of the same were constructed by authority of the Mexican Government or by its permission, if you know.

A. I do not know.

11. Q. If you have stated that you are acquainted with any of such tributaries of the Rio Grande, please state whether the flow of the same was or is constant, or whether the same is spasmodic or intermittent, describing in detail in this respect each particular tributary, and also state whether such streams are known as flood streams or perennial streams, and at what seasons of the year their floods generally come, if they are flood streams, or if large floods come down the same, and how long such floods last, and what becomes of such floods.

A. Do not know of any tributaries.

12. Q. If you have stated anything with reference to the navigation of the Rio Grande, please state the highest point on such river to which permanent navigation has ever extended.

A. I know nothing of the navigation of the river except hearsay, and that was that a steamboat ran from Brownsville to Roma once in 15 days or a month.

13. Q. If you have stated that you know anything with reference to the navigation of the Rio Grande, please state how many boats were ever used and employed in such permanent navigation and how many are now used in the same, and what was the size and capacity of each of said boat or boats and how much water each thereof drew, and how often such boats ascended or descended such river during each year, and during what months during the year they made they ascents and descents.

A. I know nothing, except as stated.

525 14. Q. If you have stated anything about any boats that navigated the Rio Grande at any time, please state whether such boats made their trips on such river on schedule time, and whether there were particular days of departure which were adhered to or whether the trips were only occasional, intermittent, and without knowledge on the part of

the public or boatmen as to when the boats would arrive at or depart from terminal or intermediate points at which they touched.

A. I do not know.

15. Q. If you have stated that there ever was any navigation on the Rio Grande or is any navigation on it now, please state to what extent the points and people along said river depended upon such navigation for commercial purposes in the past, and to what extent they depend on the same at present, and as to whether they did in the past, or do now, depend mostly on such navigation or do they depend mostly upon freighting to and from railroads and commercial centers.

A. I do not know.

16. Q. Please state how long, in recent years, it would usually take a boat to ascend the Rio Grande from Brownsville, Texas, to Rio Grande City, and give the distance between Brownsville and Rio Grande City, when measured by the course of the river, and also the distance between said points along the usual traveled wagon road between the same.

A. I do not know.

526 17. Q. Have you not personally observed hulls or wrecks of old boats inside the bar at the mouth of the Rio Grande and up the course thereof and some distance therefrom?

A. No.

18. Q. If you have said you observed any hulls or wrecks of old boats, as interrogated about, please state how those boats got there and how far up the river their wrecks were observed by you, and state, if you know, how they came to be wrecked and when they were wrecked.

A. I do not know.

19. Q. As matter of fact, is it not true that such boats got into the river over the bar at the mouth thereof? And is it not a fact that many of them were cut in two in order to get them over the bar, and were afterwards abandoned by the parties undertaking to use them? And if "Yes," state how long ago this occurred and the reason, if you know, why the boats were so abandoned.

A. I do not know.

20. Q. If you have stated that you know anything of the character of such navigation, state whether or not vessels can come in from the Gulf of Mexico to the mouth of the Rio Grande at the present time, and how far up the river they can come from such gulf. If you say they
527 can not come into the mouth of such river or up the same, please state what prevents them from so doing.

A. I do not know anything about it.

21. Q. Is there not an obstruction at the mouth of the river Rio Grande which prevents boats from going into the same from the Gulf of Mexico; and if so, what is such obstruction?

A. I do not know.

22. Q. Do you know how much fall there is in the course of the river from Ringgold Barracks to the Gulf of Mexico per mile?

A. I do not.

23. Q. What is the character of the current of the river Rio Grande immediately above its entrance into the Gulf of Mexico?

A. I do not know.

24. Q. Has the Rio Grande, for several miles from the mouth of the same, any appreciable current?

A. I do not know.

25. Q. How far up the course of the river Rio Grande do the tides of the Gulf of Mexico affect the depth of the water in the river, and at what season of the year are these tides heaviest; and when at their
528 heaviest, how far up the river do they affect the current of the same?

A. I do not know.

26. Q. In describing the character of the navigation which you testified with reference to, please state what the average depth of the water near Brownsville is during the period when it is usually deepest, and how far up the river the depth continues the same.

A. I do not know.

27. Q. At what period of the year is the depth of the river Rio Grande at Brownsville the greatest, and at what period is it the shallowest, and for how long does the depth continue at its maximum and how long does it continue at its minimum?

A. I do not know.

28. Q. How shallow does the water get in the river at Brownsville?

A. I do not know.

29. Q. What character of bed has the river Rio Grande, and is the bed of the same permanent or is it shifting? Is it rocky or is it sandy? Are there any shallows in it or any sand banks in it?

A. As far as my observation extends, which is near Laredo, the bed of the river is rocky in some places and in others sandy; but the channel is permanent within its present banks.

529 30. Q. If you have stated that there are either shallows or sand banks in the bed of the Rio Grande River, please state whether the same are below Rio Grande City; and, if they are, if they are sufficient to in any way impede the navigation of the river; and, if they are, for how long do they impede navigation.

A. I refer to the vicinity of Laredo.

31. Q. If you have stated what the condition of the bed or depth of the Rio Grande River is, please state how long such conditions have maintained within your knowledge.

A. I did not state.

32. Q. Was there ever, at any time within your knowledge, any great permanency to the channel of the Rio Grande River, so far as depth and course are concerned, or was the depth and course of the same constantly changing?

A. As far as my observation goes, the course of the river has not changed; but the depth, or amount of water, has changed and is far less.

33. Q. What effect, so far as changing the banks and the bed of the Rio Grande, would the heavy floods which came down the river have?

A. I do not know what effect it would have.

34. Q. How often during a trip up or down the river did the boat or boats which navigated the same, ground upon these sand bars or shallows?

530 A. I do not know.

35. Q. Did any one of you ever navigate the river Rio Grande on the steamer known as the "San Ramon," or a steamer bearing that character of name? If so, was that the correct name of such steamer; and if not, please give its correct name.

A. I was never on a steamer on the Rio Grande River.

36. Q. If any of you have said that you have navigated the Rio Grande River in the steamer referred to in the last preceding interrogatory, state whether any of you have any personal recollection of a trip that such steamer made in the first half of the year 1873, when it took 42 days or thereabouts to go from Brownsville to Rio Grande City; and if so, state what caused it to take such length of time, and how long it took such boat to go back down the river from Rio Grande City to Brownsville, and, if you state that it only required a few hours or a short time to do so, please state why such steamer was enabled to go back down the river more rapidly.

A. I was never on a steamboat on the Rio Grande.

37. Q. Do you remember that on the trip referred to in the last interrogatory, after said boat reached Rio Grande City a flood came down the river and furnished sufficient water to float the boat back down the stream without touching on the bars or shallows?

A. I do not know.

38. Q. In describing the navigation of the Rio Grande, please state whether the same was in the past ever a financial success; and if so, during what period it was financially successfully, and whether during the period it was so successful the navigation of the river was aided by either the Government of the United States or the Government of the Republic of Mexico.

A. I do not know.

39. Q. Please state whether or not the navigation of the Rio Grande River at the present time is successful or otherwise.

A. I do not know.

40. Q. Please state what the ruling price per hundred pounds and also per ton has been in the past, within your knowledge, for transportation between Brownsville and Rio Grande City, when carried by boat, and what the ruling price per hundred pounds and per ton, river freight, now brings on the steamboat "Bessie," between such points, and state whether there is any other steamboat plying the said river at the present time besides the "Bessie."

A. I do not know.

41. Q. In connection with the shipment of freight up and down the river Rio Grande, state whether there are any railroads which were built along the same for any distance, on either the Mexican or American side, or which compete with the steamer "Bessie," and on which side of the river such railroads are built, and the termini of the same, and when the same were completed, and for what commercial purpose the same were built.

A. I do not know.

42. Q. Please state where the goods and supplies that are shipped over any such railroad for the Rio Grande country are delivered to the road.

A. I do not know.

43. Q. Before this railroad was built, what method was there of getting shipments of freight into Rio Grande City from distant points, other than by navigation from Brownsville, and what was the cost per hundred pounds or per ton of getting such shipments by such means?

A. I suppose by ox carts, but do not know what it costs, except from Maredo it was \$1.25 per hundred pounds.

44. Q. Before such railroad was built were not the rates for river freight greatly in excess of the rates put into effect by such railroad, and which now obtain on points along the Rio Grande River, and is not freight on goods and supplies shipped over the railroad and by boat to points along the river Rio Grande now very much less than before such railroads were built? If so, was not the reduction in such freight rates caused by the construction of such railroad, and did not the construction of such railroad thereby
533 cause the declining in the navigation of the river Rio Grande?

A. I do not know.

45. Q. Could the navigation of the river from Brownsville up the stream be carried on after the construction of such railroad so as to successfully compete with the same in their freight rates between their termini and intermediate points along such river, and is not the decline of navigation on said river due to the inability of boats to compete with freight rates put in effect by such railroad?

A. I do not know.

46. Q. Do you know the location of Comargo; and if so, how long have you known it, and was there ever any considerable amount of freight ascended such river on boats to Comargo to such point?

A. I was in Camargo once, but know nothing about the freight business.

47a. Q. Was not Comargo a center for the supplying of interior points of Mexico, even at great distance away therefrom? If it was, at what distance? Please state what sized place Comargo is now and what size place it was prior to the building of such road; and if it is a place of less size now, please state if it is not also of less commercial importance than formerly. State, if you know, what has caused the decline of Comargo
in population and commercial importance.

534 47b. Q. Was not this decline of Comargo due to the construction of the Mexican International Railroad, running between Laredo and the interior points of Mexico, and connecting at Laredo with points in the United States? Does not such railroad now supply the interior points of Mexico which formerly contributed to the commercial importance of Comargo at cheaper rates of freight than could be had by navigation of the river?

A. I do not know; I suppose that the Mexican National Railroad has effected the commerce of Comargo, but it is because it is so much quicker transportation than the old route.

48. Q. If you have stated that any change has occurred in the commercial capacity of the Rio Grande River and have undertaken to state the nature of such change, please state whether such statement made were all founded upon personal observations made by you, or are partly or wholly suppositions or theories.

A. It is wholly suppositions.

49. Q. If you have undertaken to state that there are any changes in the navigable capacity of the Rio Grande River, please state what the effects of such changes were in the increase or decrease of the flow of the river at Brownsville. How much depth, more or less, did the
535 river take on at Brownsville, and what was the effect? How much depth was there, more or less, at intermediate points between

Brownsville and Ringgold Barracks, naming each place of prominence at which the water became deeper or shallower? At what points did you observe this effect? How often during the year when such effect was worked did you observe the same? How long did such effect continue?

A. I know nothing about it.

50. Q. Do you know whether in the year when such effect was first observable, or within a year or so before the same was observable, there was any use commenced of any of the waters of any of the tributaries of the Rio Grande for purposes of irrigation or otherwise? If so, to what extent were such waters of such tributaries used?

A. The river at this place (Laredo) has less water by half than it had 25 years ago; and by being less here there must be less all the way to Brownsville.

51. Q. Did you know where the San Juan River empties into the Rio Grande? Does it come from the American or Mexican side? What was the amount of water contributed by the San Juan to the Rio Grande when you first knew the Rio Grande? Was it a considerable stream or an insignificant one? State how wide it was, and about how deep, and about the rapidity of its current where it emptied into the Rio Grande, if you know.

A. I do not think that I ever saw the San Juan River, but there is a river by that name that empties into the Rio Grande below Laredo on the Mexican side.

52. Q. If you have stated that there was any change in the navigable capacity of the Rio Grande, commencing at any period named by you, state whether during the year of such change or subsequent thereto the flow of said San Juan River was more or less than it has been in past years. And is the flow of such San Juan River more or less now than it was when you first became acquainted with the Rio Grande? If so, to what extent has it increased or decreased? State, if you know, the cause of such increase or decrease. Are its waters now used for irrigation at any point on its course?

A. I know nothing about it.

53. Q. Please state if, before any change which you may have referred to in the navigability of the Rio Grande took place, you were acquainted with the amount of water flowing into the Rio Grande from the Salado, the San Antonio, the San Rodrigues, the Santiago, the San Philippe, Devils River, Goodenough, the Pecos, and the Concho. If so, state where each of these rivers or any one thereof with which you may be acquainted comes into the Rio Grande, with reference to the location of Rio Grande City; that is, the number of miles above such city the mouth of such rivers are. State about what was the size of each of those streams, the depth, width, and velocity of current at the point where the same entered into the Rio Grande. Please state which ones of said rivers were larger and which smaller than the others; also whether there had been any decrease at the time of any change in the navigability of the Rio Grande occurred in the flow of either of such streams. If so, which decreased in its flow from the time when you first knew the same up to the time when the navigable capacity of the Rio Grande underwent any change?

A. I do not know anything about it.

54. Q. As matter of fact, were you ever personally at the mouth

of any of these streams? If so, please name the same, and state when and often you were there previous to such change in the navigable capacity of the Rio Grande; also how often you have been there subsequent to such change in its navigable capacity.

537 A. I have never been at the mouth of any of the streams mentioned.

55. Q. If, in answer to the foregoing question, you should state that there has been any decrease or increase in the amount of water flowing in any of the tributaries above named since the time when you first know the same, please state, if you know, what has caused such increase or decrease.

A. See above answer.

56. Q. Do you know that the flow of such tributaries and of the Rio Grande varies any changes in accordance with the amount of rainfall which occurs from year to year over the watershed drained by such Rio Grande and its tributaries?

A. It does change the Rio Grande temporarily only.

57. Q. Do you not know that for a great many years past the rainfall in the watersheds adjacent to the Rio Grande and those tributaries in that section of Texas and Mexico has decreased and is now less than it was in the years immediately preceding 1887 and 1888?

A. Yes; the river has decreased and is less than it was before 1887 and 1888.

58. Q. As matter of fact, has there not been a drouth in that section of the country since in the eighties, and has not this drouth resulted in the death of the greater portion of cattle and sheep, and even during periods necessitated the removal of portions of the population in various places along the river?

A. That is true, and I have had some experience in that line by losing thousands of sheep and some cattle.

59. Q. As matter of fact, is there now one-half as much rainfall as there was in that section of country in such former years?

A. Yes; by one-half, more or less.

60. Q. If, in answer to the sixth direct interrogatory, you state that you know anything by personal observation as to the colors of the water of any stream which flows into the Rio Grande, between its mouth at the Gulf of Mexico and the city of El Paso, Texas, please state how you know the same.

A. I don't know.

61. Q. At what points above the head of navigation did you ever observe, personally, the colors of the waters of any such tributary, and how many times did you ever observe the color of such water above the head of navigation?

A. I have had no personal observation.

539 62. Q. If, in answering interrogatory number six, you have stated that you know the color of any water, did you answer from having seen the same during your navigation of the river, and after such water had mingled with the waters of such stream where navigable; or did you get your idea of the color from having seen it come out of the tributary before it had entered the Rio Grande?

A. I don't know.

63. Q. Can you tell the color of the water of each of the following tributaries, respectively: San Juan, Saledo, San Antonio, San Rodriguez, Santiago, San Philippe, Devils River, Pecos, and Concho? If so, please state the color of each one separately.

A. I don't know.

64. Q. What is the difference between the color of the Pecos and of the Concho? What is the difference between the color of the Concho and of the Rio Grande before the Concho empties into it?

A. I don't know.

65. Q. If you undertake to tell the color of each one of these tributaries, state how you know the same, and whether your statement is derived from hearsay or from actual observation.

A. I don't know.

66. Q. Were you ever at El Paso, Texas? If so, when and how often? Did you ever see the Rio Grande at such place? If so, what was the color of the Rio Grande at that place?

A. I was never in El Paso.

67. Q. Do you know that the color of any tributary of this stream is liable to vary and change greatly from time to time, in accordance with the droughts, the light floods, or the excessive floods, or even the particular dry arroyos through which such floods from time to time enter such tributaries?

A. I don't know.

68. Q. Do you know if a heavy rainfall comes upon any particularly timbered section of a watershed of one of these tributaries, making a flood in the tributary itself, that the color is liable to be very greatly different from the color of a flood in such tributary caused by an excessive rainfall in the nontimbered parts of the watershed of such tributary?

A. I don't know.

69. Q. If you say that you know the color of the floods of the Pecos River which empty into the Rio Grande; please state whether in recent years there has been any change in the color of the Pecos floods.

A. I don't know.

70. Q. Witness Kelly is asked whether he is the same man who made an affidavit to be used in the trial of the injunction which was granted in this case in 1896 or 1897 and whether it is true that he therein stated that he had not observed or heard remarked on the river any reference to waters which, from their color, appeared to come from the upper Rio Grande itself since in the early eighties. In this connection said witness is asked to state when he last observed flood waters while on the navigable part of the Rio Grande which from its color he judged to come from the upper Rio Grande.

71. Q. If it is true that witness Kelley has not observed any flood waters on the navigable portion of the Rio Grande which from their color he judged to come from the upper Rio Grande, then is it not true, according to his observation, that the flood waters of the Rio Grande have not contributed materially to the navigation of that stream since in the early eighties?

72. Q. For how long a period during each year, and at what time of the year, is the amount of the water in the Rio Grande,

in its navigable parts, substantially increased by flood flows coming in from its tributaries?

A. I don't know.

73. Q. During such period to what extent is that navigable depth of the Rio Grande increased, and how much is such stream widened?

A. I don't know.

74. Q. When such floods come, are the waters confined within the banks, or do such floods rise over the banks of the Rio Grande and deposit waters in lagoons, lakes, and depressions?

A. It never gets out of its banks here, as far as my observation extends.

75. Q. What portion of any particular flood which may in a week or ten days pass Ringgold Barracks will reach Brownsville? Does the amount of water which will reach Brownsville from such flood, lasting, say, a week at the head of navigation, constantly decrease as it comes down the channel and deposit itself in such bayous and lakes, or is it absorbed by the sand?

A. I don't know.

76. Q. Have you any knowledge or information as to how far below El Paso water will run in the channel of the river before it is absorbed and taken up by the sand, when, for five days, or ten days, or thirty days, at El Paso, such water ran one foot deep and fifty feet wide, or when it ran at any other particular depth or width for any given period of time at El Paso?

A. I don't know.

77. Q. Do you know what would be the effect of a flood at El Paso, Texas, which ran a thousand cubic feet per second for one day, or ten days, or twenty days, or thirty days, so far as increasing the depth and velocity of water in the river at Fort Quitman, Presidio del Norte, or the mouth of the Pecos, or Eagle Pass, or Rio Grande City, or Brownsville is concerned?

A. I don't know.

78. Q. Do you know how much the river would be raised at Rio Grande City by a flood passing El Paso, Texas, amounting to 15,000 cubic feet of water per second and running for ten days at that rate?

A. I don't know.

79. Q. Do you know in the month of May, 1897, whether any flood entered the Rio Grande from either the San Juan, Salado, San Antonio, the San Rodriguez, Santiago, San Philipe, Devils River, Pecos, or the Concho? If you , which one of those streams do you know of any flood entering the Rio Grande from during that month?

A. I don't know.

80. Q. Have you any knowledge as to whether any flood came from either one of those tributaries into the Rio Grande during that month? Please state which one of them you do not know with reference to.

A. I don't know.

81. Q. Do you know whether there was a flood from either one of these streams entering into the Rio Grande during the present calendar year? If so, which one of them had a flood and what month did the same occur in? If you do not know with reference to any one of the same during

the present year, please state which one you do not know with reference to.

A. I don't know.

82. Q. In interrogatory seven you are asked to state your full knowledge of the effect of the ordinary flow of water and of the flood waters which come from above El Paso. As a matter of fact, have you had any personal observation which will enable you to state just what regular flow or flood flow comes from El Paso or above there, or are you simply depending upon hearsay as to that?

A. I don't know.

83. Q. Do you know anything about the amount of water which have flowed regularly by El Paso since 1880 or previous thereto?

A. I don't know.

84. Q. What was the width and the depth of the water flowing in the Rio Grande, passed El Paso, in 1880? What was it in 1885? What was it in 1890? What was it in 1895? What was it in 1899?

545 A. I don't know.

85. Q. Do you know during what years between these dates or previous to these dates the river has been absolutely dry at El Paso for any considerable number of months in the year; and if so, what months?

A. I don't know.

86. Q. Do you know what flood flows passed El Paso in the years above named? Do you know how long the flood of 1897 at El Paso lasted?

A. I don't know.

87. Q. If you have testified as to any flood flows passing by El Paso during any of these years, state whether you were at El Paso and saw them or whether you were simply guessing that they passed El Paso because you saw them at some point further down the river?

A. I don't know.

88. Q. If you saw any floods down the river at any navigable part thereof during any of these years, is it not possible that they may have come from some of the tributaries of the Rio Grande above named?

A. I have not so testified.

89. Q. Is it not possible that such floods may have come from heavy rains along the Rio Grande below El Paso?

546 A. That may be true.

90. Q. How far above El Paso were you ever? Did you ever come up the Rio Grande from the head of navigation to El Paso overland and observe the flow of the Rio Grande along its entire course?

A. I was never at El Paso nor above there.

91. Q. If, in answer to interrogatory eight, you state that you have personally observed the bed of the said Rio Grande as to hollows or depressions, and that the same is porous and capable of large absorption, or that the same has sloughs or bayous and arroyos which have a natural tendency to detract from its navigable capacity during a low stage of water, and which have to be filled before the river can be raised by floods and increased flows, please state what ultimately becomes of the water which is consumed by such porous character of soil or which runs into such sloughs or bayous or arroyos.

A. I did not so state.

92. Q. Does this water stand in such sloughs and bayous until it is absorbed by the soil or by evaporation?

A. I don't know.

547 93. Q. If you state that you have observed such sloughs and bayous, state how far up the river you have observed the same, and whether practically the same condition does not continue up the stream to El Paso and north of that place.

A. I do not know.

94. Q. If you state that such sloughs and bayous check and hold these waters, and such waters sink into the sand and are absorbed, please state if these facts would not tend to constantly decrease any floods which might pass El Paso and so decrease the same as to practically consume it, so that it would not substantially aid navigation where said river is navigable.

A. I don't know.

95. Q. If, in answer to interrogatory eight, you state that the flood waters of the river are necessary to fill bayous and depressions in order to keep the regular current flowing down, then please state whether, in your opinion, that result is the greatest good produced by these floods. As matter of fact, the floods are treacherous, are they not?

A. I don't so state.

96. Q. Are you acquainted with the steamer "Bessie," and if so, what relation towards it do any of you bear? Can the steamer "Bessie" come up the Rio Grande against the flood coming down the stream with any considerable force?

A. I know nothing about the steamer "Bessie." I never saw it.

97. Q. It is a fact, is it not, that it is exceedingly trying and dangerous to the safety of the vessel and the progress of the same to undertake to navigate the river, depending upon the flood flow?

A. I don't know.

98. Q. It is true, is it not, that if the steamer comes up the Rio Grande during a flood it is exceedingly liable to be stranded by reason of the subsidence of the flood before the steamer reaches its destination?

A. I don't know.

99. Q. Can the steamer "Bessie" come up the Rio Grande at all during the heaviest flood flows which occur along its navigable course? Is it not true that she can better navigate when the floods are not greatest, and that if the excessive floods were lessened she would make quicker and safer trips?

A. I don't know.

549 100. Q. How many irrigating ditches do you know of from the vicinity of El Paso to Brownsville, Texas? If any, where are the same located and how much of the Rio Grande do they divert, and on which of the river are they—on the American or Mexican side?

A. I do not know of any such.

101. Q. In direct interrogatory tenth you are asked what would be the effect of storing water 125 miles above El Paso, Texas, so far as the navigability of said river is concerned. Do you know a point named as Elephant Butte, about 125 miles above El Paso, Texas? Were you ever at such point? Do you know whether the bed of the proposed reservoir at Elephant Butte is sandy or whether the river at that point flows through a rocky cañon? When were you there?

A. I was never at El Paso nor above there on the Rio Grande River.

102. Q. Do you know the character of the bed of such stream below Elephant Butte down to a point of rocks just below Las Cruces, New Mexico? What is the character of the bed of such stream at such point?

A. I know nothing about it.

103. Q. Have you ever been connected with an irrigation company or had any experience in the use of waters of reservoirs? If so, where, and what experience have you had? How large was the reservoir with which you had such experience?

A. I was never connected with any irrigation company nor had any experience in that line.

550 104. Q. Do you know what per cent of the waters which would be impounded by a dam thrown across the river 125 miles above El Paso, Texas, would pass off by evaporation?

A. No.

105. Q. Suppose such dam held water 50 feet deep, ten miles long, and a mile wide, what amount in depth of such water in such place would pass off by evaporation, and how do you know that?

A. I can not tell anything about it.

106. Q. Do you know how much such water, when being let out of such dam and used in the neighborhood thereof for irrigation without being taken out of the valley of the Rio Grande, would return to the Rio Grande and contribute to its flow? If so, what per cent would so return? What would become of the balance of the water? What part would pass off in vegetation? What per cent of what is lost would be due to absorption?

A. I can not say so.

107. Q. What would be the effect upon the flow of the river at its navigable parts if the water of the stream so impounded at this point, 125 miles above El Paso, and used, as is asked in direct interrogatory tenth, for manufacturing purposes and let back into the river into such quantities as would be sufficient to supply all ordinary manufacturing purposes which might be located thereunder?

A. It would certainly make less water in the navigable part of the Rio Grande, but much less I can not say.

551 108. Q. As matter of fact, have you sufficient technical knowledge to be certain what the effect of impounding the waters of the Rio Grande 125 miles above El Paso and using them along the banks of the stream for irrigation would have upon the flow? Do you not know it to be a fact that such acts would tend to equalize the average flow of such river?

A. I have no technical knowledge of the matter; but as a matter of fact such impounding of the water and its use for irrigation lessens the flow below such point.

109. Q. If 500 cubic feet of water per second were taken out of a reservoir constructed 125 miles above El Paso, how much of it would reach El Paso and how much of it would be lost in the bed of the river itself by absorption and evaporation?

A. I do not know.

110. Q. If five hundred feet of water reached El Paso, Texas, traveling down the bed of the stream after having been turned out of the reservoir 125 miles above El Paso, how much of it would be diverted out of

the stream by the Juarez dam at El Paso and flow off down the Juarez canal on the Mexican side, and how much of it would be diverted by the El Paso wing dam and flow down to El Paso?

A. I do not know.

111. Q. If you have stated that the flood of waters of the upper Rio Grande ever reached the lower portion of the river, please state at what season of the year the floods usually come down the river.

A. The floods usually come down in the months of May, June, and July of each year.

552 112. Q. If any of the floods waters from El Paso or above ever come down the Rio Grande, and you have undertaken to state that there are any sloughs, bayous, or arroyos in the bed of the stream which such flood waters might fill up or that such flood waters do actually fill up the same, please state when the flood waters fill the same, and how long the waters remain therein. State if it is not a fact that even if enough flood waters come down to fill the sloughs, bayous, and depressions in the bed of the Rio Grande, that such flood waters would and do evaporate or disappear before the perennial flow of the Rio Grande comes down the same.

A. I can not say.

113. Q. Have not the floods of the Rio Grande at Presidio, Rio Grande City, Laredo, Eagle Pass, and Brownsville been greater during the present year than they have been for many years previous? If you answer that they have not, please state during what years, within the past ten years, and during what month in such years there have been heavier floods than during the present year. In your answer name each year during the last ten years, and the month or months of each year during which the floods have been greater than they have during the present year at the points mentioned. And state if you know that the highest water reached by the river at each of such points during the present year and the time of such high water and the highest water at each of said points during the past ten years.

A. The rise in the river at Laredo this year was greater than in the last ten years.

553 114. Q. With whom have you conversed about giving testimony in this case? Were you asked to come in person at the trial of this case, and give your personal evidence, by anyone; and if so, whom? When did you first see or have read to you the interrogatories and cross-interrogatories which have been propounded to you, and who first showed them to you and told you of the same?

A. I had a conversation with Mr. Sutton about a month ago about the floods in the river, but I was never asked to come to court to testify in the case. S. T. Foster, the U. S. commissioner, first showed me the interrogatories and cross-interrogatories, and read them to me, one by one, as I answered the same.

115. Q. Have you read over such interrogatories or cross-interrogatories with anyone previous to having the same propounded to you by the officer taking your deposition? If so, with whom did you read over the same?

A. I never read them, nor did anyone else read them to me previous to having my answer taken.

116. Q. Has anyone written out for you or furnished you with a written answer or suggested a written answer which would be suitable to any of the interrogatories or cross-interrogatories which have been submitted to you? If so, who has done so?

A. No one.

117. Q. Has any one suggested any portion of the answers or any portion of an answer to this interrogatories? If so, whom?

A. No one.

554 118. Q. Do you speak English or have the questions been translated to you? If so, have your replies thereto been translated into English before being written down?

A. I speak English fluently.

119. Q. In whose presence and where and on what day have you given this answer? Name every one who has been present while you were giving this testimony, listening to the same. Has any attorney been present; if so, give his name and state whether he has the attorney for plaintiff or for the defendant.

A. There has been no one present besides the U. S. Commissioner, S. T. Foster, and myself.

120. Q. Has any one representing the United States Government, or pretending to so represent it, been present at the taking of this testimony? If so, state his name.

A. None.

(Signed)

RAYMOND MARTIN.

555 WARNER P. SUTTON, another witness on behalf of the Government, the plaintiff, having been duly sworn to testify the truth, the whole truth, etc., on being examined by Judge M. C. Burch, testified as follows:

On direct examination:

Q. What is your residence?

A. My legal residence is Michigan, but my office residence is Washington, D. C.

Q. Are you connected with the Government in any way?

A. At present as a special assistant United States attorney.

Q. Just for the purpose of this case?

A. Only.

Q. What is your regular business?

A. International law.

Q. Are you acquainted in this southwestern portion of the United States and the Republic of Mexico?

A. Yes, sir; I am.

Q. When did you become acquainted with the Rio Grande River, if you have any acquaintance with it?

A. In October, 1878, I reached Brownsville from the north and crossed the river to Matamoras.

Q. Were you in any official capacity at that time?

A. I was.

Q. What?

A. Commercial agent. United States commercial agent to Matamoras.

Q. Did you occupy other official positions after that?

A. I did.

Q. What?

A. In 1879 I was promoted to be consul at Matamoras, and in 1883 I was made consul-general there, and in 1889, after serving as chief clerk to the International American Conference on special detail, I was consul-general at Nueve Laredo, across from Laredo, Texas.

556 Q. Covering a period of 1878 to 1893, since that, you haven't been connected in any official capacity, except temporarily on this case?

A. Temporarily on this case only.

Q. When did you say you arrived at Matamoras, Texas; when did you say?

A. In October, 1878.

Q. Since that time have you had, during the time of your public services connected with the State Department, did you have much knowledge of the Rio Grande River?

A. Yes, sir; in the way that an ordinary observer would have. Not as an expert, just as an ordinary observer would have.

Q. At what points did you live along the Rio Grande River?

A. At Matamoras and Nueve Laredo.

Q. Matamoras is opposite Brownsville?

A. Brownsville, Texas.

Q. Nueve Laredo is opposite what?

A. Laredo, Texas.

Q. During that time did you ever have any experience in travelling up and down the stream?

A. Yes, sir.

Q. From what points, and to what points? State fully.

A. In 1879 I went from Brownsville in the steamer "Andrew Auckley" up to Rio Grande City. From there I went by military transportation to Roma.

Q. On the river or along the river?

A. Along the river road by military ambulance. And there I crossed the river and went to Mier, and from Mier I went to Guerrero, also by ambulance. And at Guerrero, crossing the Salado or Sabinas, which is the Salado there, and from Guerrero down to the mouth at Carrizo, at the mouth, and then on the river road to Laredo. And later from Laredo to Eagle Pass. From Eagle Pass to Fort Clark, which was then and is not Fort Brackett, called Spofford's Junction. From there to what is now Del Rio, and then up the Devil's River, and from
557 there to the Pecos. Went to the mouth of the Pecos some time in November, 1879. Then I retraced my journey down the river on the Mexican side and going on to Monterey and returning to Matamoras.

Q. Have you ever travelled upon the upper rivers of the river?

A. Only by rail, as we go on these railroads. I have travelled on the Santa Fe, going through here and across the river at El Paso—I think on both roads—and I have travelled on the Southern Pacific where it touches the Devil's River, and of course we came near to it again at El Paso.

Q. Have you been frequently at El Paso?

A. I have been there between six and twelve times. I couldn't tell exactly—perhaps more.

Q. Will you please state what tributaries there are to the stream, of your own knowledge—that is, what tributaries you have seen or visited?

A. I have seen the San Juan. I have gone up the San Juan four, five, or six miles from its mouth to the city of Comargo. That portion of the river which is called an estuary and in which the current is sometimes strong, when there is a flood in the San Juan, and sometimes there is hardly any current, near the lower or mouth of the estuary. I have gone up there in a rowboat. The San Juan, every time I have seen it, has been a perennial stream in most of its course, but two or three times when I have crossed it near Comargo there have been stretches of half a mile, more or less, where there was no flow, and yet for fifty or a hundred miles above there, as I discovered when I made the return, up near Montemorelos, the river was flowing very evenly. And then I have seen it in flood when it was a pretty considerable stream. Above that is the Alamo, which is a little stream, sometimes called the river Mier, which flows three to six months in a year and is dry in many places, with pools, depending largely on the rainy season, and during that season flows more or less. Above that is the Salado, also called the Sabinas, which

558 on the San Juan—that is, it may be flowing for a hundred miles in its upper routes and still be very dry in the lower.

Mr. HAWKINS: Which stream is that?

A. That is the Salado, or Sabinas. The conditions that I have noticed of the river flowing, have been when the Sabinas was at flood, and that part that is called the Salado, below the junction of the two. There were spaces where the water was not flowing. Above there, there is an inconsiderable stream near Porfirio Diaz, sometimes called Piedras Negras.

Q. Called what?

A. I don't know the name of it. Perhaps it is Escondidas. I don't think its name is on the map. And on the American side, the first one that could be called a stream, is the Devil's River. When I crossed in October, 1879, it was, on a rough estimate, 150 ft. broad, with a current of three to six inches—not over a foot and a half—on a hard rock bottom, across which we drove with the ambulance. The stream was a swift running little stream, very clear water at that time, because it was not in flood. Above that the Pecos, which flows through a very deep ravine, and is a more considerable stream; has a bed, I should not, not wider than where I crossed Devil's River, but the Devil's River was then only fordable at one place in seventy miles. It is much narrower often than at that place where the military crossing was, so that while the Pecos was not much wider, yet it was deeper and had a greater flow.

Q. Did you go to the mouth of the Pecos?

A. I went to the mouth of the Pecos.

Q. How did you go, and with whom?

A. I went with a Sumido Indian negro scout, who was in the employ of the United States as a scout. I think he was in Lieutenant Bullis' company. We walked over from our camp, some mile and a half above the mouth, down to the mouth. I know it, because my suit of clothes—

because my clothes were literally torn into shreds by the bushes we had to get through, going and coming.

Q. Was the Pecos in flood at that time?

559 A. No, it was not in flood; it was not even filling the inner bank. Of course there is an inner bank for its regular flow, which was two to five or six feet—whatever the current of the stream—and this, of course—in this there was the flow, which was narrow, and was not at all on a flood.

Q. How about the Rio Grande?

A. The Rio Grande was not on flood, but seemed to be on what we would call an even stage of water, and was flowing at about the same, I think, with the Pecos; that is, the two joined easily.

Q. Seemed to be flowing down from above?

A. From above.

Q. Between there and El Paso, are there any streams of any consequence?

A. There is one stream, the Concho, on the Mexican side.

Q. What time of the year was this, October or November?

A. I started in October and returned in November, so it was in one of these two months.

Q. In the year 1879?

A. In the year 1879.

Q. Now, can you say what the color of the Pecos was at that time?

A. Well, I am color blind. I am not reliable as to colors. I should say it was reddish, but I don't think my testimony as to color would be valuable. It was muddy, reddish color. It might not be in flood time; it was in its ordinary flood.

Q. Now, returning to Brownsville, what can you say as to navigation down there—navigability of the stream?

A. When I went there in 1878 the navigation from Brownsville down river, out from the pier and around the Brazos Santiago, had been definitely abandoned. In fact, the war against the Yankees and Gochepins—the planters, who were called the Gochepins, had built the railway from Point Isabel to Brownsville, and *and* competed with King, Kennedy & Company, which was in those days—Mr. Robert Dalzell

and William Kelly, competed with their steamers that went
560 out over the bar and up the Gulf to Brazos Santiago, and it finally resulted in driving them out of business, so that there was no navigation in the lower river from Brownsville to the mouth. The steamers that had been in that trade, were some, I think, there tied up, and other steamboats were engaged in the up-river traffic.

Q. Whether that traffic was considerable at that time?

A. Well, I am not enabled to name more than one steamer that was actively running that I had personal knowledge of. My impression is that there were others. I only know of one on which I went, the "Andrew Auckley." Afterwards there were others—the "Lulu D.," and there is one now, the "Bessie," and perhaps some others in between, but there were one or two boats then on the upper river during 1878 and 1879. I don't just recall when they changed from one boat to another.

Q. Did your official duties lead you to become acquainted in anyway with anything in the way of the navigation or commerce of the river.

A. Commerce in a general way. It was my duty to report upon that, and the rates of freight and the times of sailing, and the places supplied by these steamers were also the basis for official reports.

Q. You remember whether at that time these steamers were plying in the American trade, or Mexican, or both?

A. In the American trade; but they cleared for Rio Grande City, Comargo, when they chose, and came back to the American ports. I don't recall, but I think, however, that they came once or twice to Matamoros, either on the up trip or down trip, but I am not certain.

Q. How long did that observation continue of that navigation before you moved to Nuevo Laredo? How long was you there, in other words, at Matamoros?

A. About eleven years.

Q. At Matamoros?

A. At Matamoros.

Q. That would take you up to what time?

A. That would take me until early in 1889, and in 1889 I was transferred to Nuevo Laredo, but between this date and after that date
561 I frequently went on an inspection into the interior of Mexico and up the river to El Paso and Chihuahua.

Q. What can you say, at that time, of irrigation on the San Juan? Was there any diversion of the waters of the San Juan?

A. I knew nothing of any irrigation. There has be'n none of any account, that I know of, on the lower waters. In 1889 I knew of two or three farms near Matamoros which were irrigated, and I think one or two farms have been added to that since.

Q. Was there any to take much water out?

A. I think they irrigated two or three hundred acres, all told.

Q. What can you say of the next stream above the Alamo?

A. I don't think there is any.

Q. Do you know anything about the San Juan, at the present time, as to whether it takes out waters?

A. I don't know of my own knowledge that there is any, but it is my opinion that there is none of any account.

Mr. HAWKINS. We move to strike that out.

Judge BURCH. Well, strike it out.

Q. Now, then, as the Alamo, how about that?

A. All the knowledge I have is from going across it at different places, and I never saw any.

Q. Did you ever hear of any?

A. Never heard of any.

Q. How is the next stream above?

A. The Salado. As to the Salado, I never heard of any irrigation on that stream. But the Salado is composed of the Salado and the Sabinas, and of the two the Sabinas is perhaps the longer, and that flows from the mountains of Coahuila and in the town of Sabinas to the International Railway in the Santa Roza country, as we speak of it. Somewhere in the '80's, I can't recall whether it was before I went to Laredo or afterwards, that I visited that Sabinas country, and I found there possibly two, three, four, or five hundred acres irrigated by ditches taken out some miles above—cultivated portions of the narrow valley.

562 Q. Was it ancient or recent in appearance?

A. From the trees, I considered it had been there for many years.

Q. Well, now, what have you to say as to the next stream above?

A. The next stream above is the Concho, and all I know of that is that I have seen it in the State of Chihuahua, far down on the Mexican Central. In the Balson de Mapimi they take out water when it flows for irrigation.

Q. Was that ancient?

A. That is from the time of the Aztecs, and from the time of the Spanish Conquistadores. For three hundred years they have taken the waters—all the water they could get hold of—but the floods come and get away from them. I think their stream is rough.

Q. Have you heard of anything more recent, read of it in reports, or received reports of anything more recent as to the Concho?

Mr. HAWKINS. We object.

Judge BURCH. We think——

The COURT. It would be necessary to ascertain——

Q. Did you have reports, any official reports, while you were acting at Nuevo Laredo or otherwise about irrigation on the Concho?

A. No; because there was none, I think.

Mr. HAWKINS. We move to strike that out.

Judge BURCH. It may be stricken——

Mr. HAWKINS. Never mind. Let it stay in.

Q. Now, Mr. Sutton, in regard to the Pecos. The San Juan was the highest river on the Mexican side?

A. Yes, sir.

Q. Now, beginning with the Pecos, coming down, do you know of any diversion of water there, personally or otherwise; do you know personally of any diversion of water there on the Pecos?

A. No.

Q. Do you know personally anything about it?

A. No.

Q. Following down along the stream, either the stream itself or any other water, do you know of any?

A. The only irrigation I know of on the Rio Grande that I haven't already mentioned, and in the State of Texas, is below the Concho and the Pecos, is that at North Laredo, where they pump out a quantity of water.

Q. The same Mr. Haynes mentioned?

A. The same he mentioned; we call it North Laredo.

Q. Couple of hundred acres?

A. Something near that amount. I think it varies from one hundred to something like two hundred acres. I haven't been over it, but a casual estimate. There is irrigation on the Mexican side below Juarez, and there is some on the American side below El Paso. I think that tributary of the Rio Grande that empties in near Porfirio Diaz has a number of ditches taken out on it.

Q. Now what, Mr. Sutton, have you to say about your observation of the floods of the river—the flow of the river. Well, in the first place, I will ask you what you know about the bed—the general character of the bed of the river from Brownsville up as far as your knowledge extends?

A. The bed of the river from the pier at Bagdad up to Brownsville, from Brownsville to, I think, a little below Rio Grande City, is uniformly a clayish, sandy loam. That is the nearest description I can give of it. It is very hard when it is dry, and that cuts like cheese when it is wet; and when the current goes against it the mud solidifies after a little time if the current is not too strong. It is porous when it is dry, that is, the first water running over falls right down in for a few minutes or half an hour; but if the water carries a deposit of silt in it, that is, if it is a flood water or muddy water, it very often coats a kind of slimy substance, so that it makes a channel. When the river rises and the current swings out in its banks, it will strike first one place, where there is a bend, and in there it will make a whirlpool, and will make a very deep hold. At that particular point it eats away from the bend and then takes a shoot off in another direction, and so on until it gets straightened out and goes more directly. In other words, makes a cut-off, and if it keeps
564 on and eats in it may make a bad banco there and cut-off, or it may keep on its regular way.

Q. Well, now, not so much about the waters, but the bed of the stream. You have gone to pretty near Rio Grande City; what have you so further up than that?

A. At that point, or somewhere near, according to my recollection, we find the first rock in the bottom of the river, but I am not certain whether it is below or just above. My impression is that it is a little below that we find the first rock. The river resumes its first condition, and maintains that up to very nearly Roma. Then the banks are narrower; that is, the valley is narrower, and there is less of a valley. There is more rock in the bottom. It is a harder soil, and from there on up to Eagle Pass it is a high bank; that is, there is no cut away of the bank, and the water, all the changes it makes, it changes from one side to the other at different times. Above Eagle Pass it is still more confined, and still more rocky bottom, and that obtains as far as—I have seen it up as far as the mouth of the Pecos. In fact, above that, it is a very high, rocky walls.

Q. That is as far up as you know?

A. That is as far as I have personal knowledge on the river, except what little I know about it at El Paso.

Q. And above?

A. And above.

Q. Now, going back to the flow of the river, I would like to know what your observation was in regard to what we call perennial or regular flow and flood flows, during your fifteen years' observation there, if you can say as to flow as you began some time ago?

A. Well, we divide the floods into two kinds, the lower-country floods and the up-river floods. We distinguish the lower-river floods by their rising, of their quick rising and strong flowing. We call up-river floods those which rise more slowly, do not come so high, yet pertain longer, but as to whether these up-river floods come from the Pecos or the Concho, or from the other upper waters of the Rio Grande, all I know is what watermen said. I know nothing myself.

565 Q. Now, when, about what seasons of the year did these so-called up-river floods come in, if you recall?

A. The latter part of May, and those were what I was told and we assumed to be up-river floods, and along in July or September, or even later, those that were supposed to be from the Pecos or the Concho, but we knew nothing of that. We just assumed it. From June until August or September were what we called the up-river floods, but even a low-river flood would sandwich itself right on top of the other floods and mingle, so we couldn't tell anything about it.

Q. What do you mean by that, as to a long flood or apparently subsisting, when another one would come in?

A. We have had a flood which was rising slowly and steadily day by day, and not a menace to the crops along the border of the river, when the San Juan would suddenly wake up some morning and pour large quantities of water in there and make a river forty miles wide.

Q. Have you seen it?

A. I have seen the water forty miles wide. We have gone right out on the flooded lands from Matamoros and taken a sailboat, which we made to fit the occasion, and sailed on one tack fifteen miles. The country was all flooded, because these up-river rises had filled the banks pretty full, when the San Juan woke up and came down with a tremendous flow of water and spread out over everything.

Q. When was that?

A. I should say that was in 1881 or 1882; I had been North on leave, and had returned to find that condition of water.

Q. Well, go on; now, about those floods, and about their effect upon navigation, etc., first, I would like to ask you whether, at that time, was navigation constant or intermittent?

A. O, no; the boats didn't start on a regular day. The paper usually announced that the steamboat was loading for Rio Grande City, or for Comargo, or for up-river points, and would sail in a few days, and then the people that wished to go went around to the office of Jerry Galboa & Co., or Mr. Kelley's office, whichever one was in charge, and find out that the boat would go by such a day, and get their cargo on and arrange their passage, and went.

Q. Well, was that pretty much the year round, or was it only a short portion of the year?

A. Nearly all the year around. At first, as far as I noticed, I knew of no interruption, yet there were occasional delays.

Q. Did I forget it—what season of the year was *that* it that that water was forty miles wide that you spoke of?

A. It must have been in September, October, or November, because when I went north it must have be'n in October—September, October, or November. The water lasted there for nearly a year.

Q. That broad?

A. No; gradually reducing. A year later we drove across it in a carriage and on dry ground.

Q. Well, now, did you, within your period of observation, notice the waters receding; that is, grow less in volume?

A. Yes; there was a marked decrease from what the river averaged in 1878 and 1879 in later years. The volume of the water at medium or low water was less than it was in 1878 or 1879.

Q. Well, in what way did the decrease make itself manifest—what month of the season or year, etc.?

A. I first noticed it in the boats going across the river, because I went across the river from four or five times a week on an average, and the boatmen would have to go further up to get around these shallows, and they would complain about the water, its getting lower, and staying lower longer than before.

Q. Well, what was the condition of it as to floods and navigation as late, we will say, as 1888?

A. Well, it was less—it was some less. I can not say how much less, but it was a river that by common repute, and my observation, seemed to carry less in average flow.

567 Q. Per annum?

A. Per five years average; because there were rises and falls, and rains and drouths in that country, and the general average for one five years was less than for the preceding five.

Q. How late did you say that you lived there?

A. I left Matamoros in 1889, and came to Laredo.

Q. But did you have occasion to go back again—back and forth?

A. I went back to Matamoros in 1892.

Q. You know what season—what portion of 1892?

A. It was in October or November, 1892.

Q. What method of travel?

A. I went down by the train on the Texas-Mexican Railway, and then staged across to Rio Grande City. I crossed the river at Rio Grande City and Brownsville.

Q. Do you remember the condition of the river then?

A. Yes; it was lower than usual. It was a low river.

Q. Then, after you moved up to Laredo—you called it Laredo instead of Nuevo Laredo—up in that vicinity, I will ask you what you observed then of the floods that came down the river; you were there five or six years?

A. There four and a half years.

Q. That was early in the '90s?

A. 1889 to 1893.

Q. I will ask you what you noticed then of the floods coming down the river?

A. Well, we drove across the river quite frequently, and we saw rises, and when a strong, sharp, high rise came we concluded that it was from the lower waters, but where the river rose steadily day by day and held up, it was an up-river rise; that is, we called it so, but water from the Pecos, Concho, or upper waters, we never knew. People had said that this is so and so. I don't think they knew, and I certainly knew nothing of it.

568 Q. How long did these larger rises generally extend? What period of time did they last? What you would call the up-river rise?

A. They were two weeks—kept or held up a week or two, and two or three weeks generally.

Q. Did they occur every year?

A. Well, I didn't notice. I should presume they did. I should presume also that they occurred about twice a year.

Q. What do you mean by you should presume?

A. That is my impression. I didn't notice this feature of it and take note, but that is my recollection of it now.

Q. That is your recollection. To the best of your recollection they generally occurred twice a year?

A. They generally occurred. I think they might skip very easily sometimes.

Q. Since that time have you had any observation—since you left in 1893; any personal observation?

A. I was back in 1894 and 1895. I was back again in 1895.

Q. Where to?

A. I went to El Paso in January, 1895, and on to the City of Mexico, and came out at Laredo again. In July, 1895, I went to Laredo.

Q. Well, did you stay for any such length of time that you observed the river?

A. I stayed a week or ten days at El Paso, and a week or ten days each time at Laredo.

Cross-examination. Examined by Mr. HAWKINS:

Q. What is your business at the present time, did you say?

A. We call it international law.

Q. Called what?

A. The work that I am usually engaged in.

569 Q. You mean representing some of the nations as between themselves, or practicing before the ordinary courts?

A. As to the first, yes; as to the second, no; but before the State Department?

Q. What nations do you represent?

A. That is not a matter, I think, that I can discuss here, if I represent any.

Q. I understood you to say you are engaged in international law, in representing some nations?

A. No.

Q. Don't represent any nations?

A. I didn't say I did. I didn't say whether I did or not.

Q. Do you represent the nation of Mexico in this suit?

A. I do not.

Q. Do you decline to say whom you represent?

A. I will leave it to the court. It has no relation to Mexico nor to the United States.

Q. Where do you hold forth? Where is your headquarters?

A. Washington.

Q. How came you to be employed in this suit?

A. I knew Judge Burch. He knew I had lived on the river; that I might be of service to the United States; asked me if I would consent to come and assist him, and I said I would, and I did.

Q. Did he ask you to come as a witness, or in what capacity?

A. Asked me to come as an attorney.

Q. What duties were devolved upon you in connection with the case as an attorney?

A. To go down the river, see what witness could be found who knew of the condition of the river, send him their names, and more or less the knowledge which they might be able to give, so that it would assist him

in framing his questions, and to be of such other service as he might wish.

Q. Did that include your being a witness?

A. It did not.

Q. You knew something of this suit several years ago?

A. I knew of the suit when it was first published in the newspapers.

Q. Were you in El Paso in 1897?

A. You will have to let me figure out; '96 was the Presidential campaign—I think not. I am quite confident that I was not in El Paso in 1897.

Q. Were you there in 1896?

A. No; what year?

Q. 1896.

A. No; I was not, in 1896. I was in politics, that I am sure of.

Q. You were not in international law in 1896—you was in politics?

A. I was in politics; yes, sir.

Q. In 1897, didn't you, in El Paso, Texas, in conversation with a Mr. Hawley and Mr. Roberts, the president of this company, state to them that you were acquainted with the motives of the Government in bringing this suit, and that the suit, so far as navigation was concerned, was a farce?

A. I don't think I have the honor of this gentleman's acquaintance.

Q. Weren't you down at that time seeking to become the attorney of this company, and stated such matters to them then?

A. No; I did not.

Q. Were you there in 1895?

A. Yes.

Q. Did you at that time seek to become the attorney of this company, of these gentlemen?

A. I did not.

Q. And you never stated to them, or either of them, in El Paso, that you were acquainted with the motives of the suit, and, so far as navigation was concerned, the suit was a farce?

A. I did not so state.

Q. Nor nothing of that character?

A. Nor nothing of that character, neither to them nor to any-
571 one else.

Q. How long have you been engaged on the Rio Grande getting testimony with reference to this trial?

A. Well, I have not been getting testimony. I have been looking up witnesses and having the commissions coming there, and so on. I was not present when the depositions were taken.

Q. What place did you go to?

A. First to Porfirio Diaz, Nuevo Laredo, Laredo, Hebbronville, Rio Grande City, Camargo, San Miguel, Matamoros, and Brownsville.

Q. Are you a practicing attorney in Washington, D. C.?

A. In the State Department.

Q. Just practice before the State Department?

A. Yes.

Q. Are you employed by the State Department in this case?

A. I am employed by the Department of Justice.

Q. Were you at work in the State Department at the time you were employed by the Department of Justice?

A. I was not.

Q. How long since you have been at work in the employ of the State Department?

A. August, 1893.

Q. When did you first enter the employ of the State Department?

A. I think I took the oath of office in May, 1878.

Q. In what capacity then?

A. As commercial agent.

Q. At what place?

A. Matamoros.

Q. How long did you continue as commercial agent at Matamoros?

A. From May, 1878, until February or March or April of 1879—about a year, more or less.

Q. What was the scope of your duties?

A. Consul, but the title was different.

Q. They didn't give you the title?

A. The Mexican Government had not been recognized by our Government at the time of my appointment. It was inconvenient to name a consul before the Government had recognition. As soon as Mexico was recognized I was made consul.

572 Q. Did you ever make any reports with reference to irrigation on the tributaries of the Rio Grande to the Department of State while acting in your capacity as commercial agent?

A. I reported everything in the earth.

Q. Answer my question.

A. I will answer it, and it is extremely difficult for me to say. I have no recollection of ever having made any report, either of my own or sent to officials, as to irrigation on the Rio Grande, except in a general way, in speaking of the advantage of that lower river as an agricultural country. There is no scheme, project, or plan that I can recall. They are all printed.

Q. You never were the promoter of an irrigation enterprise down there yourself?

A. Never.

Q. Did you receive reports from any of your agents in that country with reference to irrigation?

A. If you will allow me to add to my answer. As to being a promoter, in 1890 or 1891, a Col. E. L. Corthell, an eminent civil engineer, asked me about irrigation near Laredo, and he wrote at my suggestion and on my advice, without my having any particular interest in the matter, to the Government of Mexico seeking a concession on the part of the Government of Mexico, which was declined because they did not choose to give any concession pending this question; but I had no interest in it myself.

Q. A concession at what place?

A. Above Laredo.

Q. On the Rio Grande?

A. On the Rio Grande.

Q. What year was that?

A. It was, I should think, 1890 or 1891. I had no interest in it. I simply advised him, and he wrote the letter and signed it.

Q. Were you to have any interest in it if he succeeded in getting it?

A. I was not.

Q. You were the representative of the United States down there at that time, while navigation was declining from the lack of water, and yet you were carrying on an agreement, or participating in the wishes of another gentleman, to take water from the Rio Grande for the purpose of irrigation, then, as I understand you?

A. As I understand the question, my public duties contemplated and demanded of me that I should be civil to every American coming there, as I would have done to you. I rendered him that service; I gave him that advice in good faith. I charged him nothing, and had no interest present or prospective, only that that was a part of the public duties for which I was placed there.

Q. Was a part of your public duties to help violate the law?

A. It was not violating any law that I had ever heard of. That was before May, 1897, if you please.

Q. May, 1897?

A. Must have been in 1890 or 1891 or 1892.

Q. I believe the act we are trying was passed in 1890.

Mr. CHILDERS. One of them was.

Mr. HAWKINS. Well, he didn't get his concession.

Judge BURCH. I think the limit has been received in that. I object.

Mr. HAWKINS. All right; we won't pursue it any further.

Q. How far up the bed of the San Juan did you ever travel?

A. It is between four and six miles that I travelled in the bed. By a rowboat I have crossed it at other places above.

Q. Where?

A. At Camargo, and at Nuevo Camargo, I think it is, and at Montemorelos.

Q. What is the distance?

A. Nuevo Camargo is a little ranch close by.

Q. How high up have you ever crossed it?

A. Montemorelos; is a matter, I should judge, without looking at the map, 125 miles in a direct line.

Q. Do you know whether there is any irrigation between that point and Camargo?

A. I do not know.

Q. Your agents never reported to you?

574 A. I had no agents in that immediate part.

Q. Do you know whether irrigation has increased there in recent years or decreased?

A. You wish to know my knowledge?

Q. Yes, sir.

A. I don't think it has increased much; a little, perhaps. I think there are two farms that I didn't know of many years ago.

Q. Do you know?

A. One of them, I am not certain.

Q. Do you know is the question.

A. There has been a farm or two—one or two acres more; that is all I know of.

Q. Do you know.

A. I know of those two.

Q. Do you know whether that is all?

A. That is all that I know of.

Q. Now, is the San Juan River—how long is the San Juan River?

A. I can't give the exact length.

Q. Is it two hundred or five hundred miles?

A. Longer.

Q. How much longer?

A. It is between one and two hundred, I should say.

Q. Were you ever at its head?

A. No.

Q. Do you know how many people live from its mouth to the head?

A. No.

Q. Do you know how many towns there are between the mouth and head.

A. I know two—Comargo and Montemorelos; that is all I know.

Q. You don't know whether there are others or not, do you?

A. I don't know.

Q. Do you know whether there is five or twenty thousand people in that valley?

A. I should judge about twenty thousand from its upper to its lower points.

Q. How do you judge?

A. Traveled over the country.

Q. You said that down near its mouth you remember occasions when the San Juan was not flowing, but up some distance above there, on the same trip, you crossed it when it flowed. What was the distance between these two points?

A. I should say a hundred miles, perhaps.

575 Q. At the upper point it was flowing a strong stream or insignificant?

A. Well, it is hard to tell, not being a technical expert, but it was wider than usual, and it was flowing over the rock. I should say, at the place where we crossed it, it was 150 ft. wide, and half mile further on was another branch that might have been half as much.

Q. And yet, down here—the mouth of the river, it was not flowing at all?

A. Where I had been two weeks before, in its lower waters, there was half a mile of practically no water—mud holes and pool—and what should be the stream I could see apparently had no current to it.

Q. And the same thing is true of one branch of the Salado—you observed the same?

A. I have observed when one branch of the Salado was flowing that the Salado itself was not flowing.

Q. Now, you say you don't know what the name of this inconsiderable stream—the one up towards Negras—was?

A. No; I don't think I do, unless it was the Escondido. It might have been that.

Q. What was the comparative flow of the river San Juan, as a usual thing, when you observed it, and of the Rio Grande, where the two joined?

A. The San Juan, when it was flowing, is a little stream, and the Rio Grande was a larger stream; whether it was one-tenth or one-fifteenth of the size of the main river I can't tell, but there was a very great difference and a very strong difference.

Q. But when the San Juan was in flood, then it was greater or less than the Rio Grande?

A. Oh, no; it wasn't greater than I ever saw. I never saw it at high flood.

Q. How about this flood that came down and made forty miles?

A. I wasn't there when it came down.

Q. You say you saw the Devil's River in 1879?

A. Yes, sir.

Q. On that trip that you made from Brownsville?

A. Yes, sir.

Q. And you estimate that then it was 150 ft. broad and the
576 current was from three to six inches deep, and flowed over a hard bottom; what point was that?

A. That was where the military road crosses the river; I think the only crossing for seventy miles. Lieutenant Bullis had made that road.

Q. Is that the only way you ever saw it?

A. That is the only time I ever saw it by wagon travel. I have crossed it on trains.

Q. On trains?

A. In trains several times since.

Q. What size steamer is the "Alamo?"

A. My recollection—first recollection—of the "Alamo" was when I sent down in it, and the buggy got stuck in the mud. It wasn't flowing. The water would flow for a mile and then apparently not flow. It is a small stream.

Q. Which is the largest stream, the Pecos or Devil's River?

A. The Pecos is much the larger stream.

Q. Is that the general condition?

A. Yes; I think so.

Q. How many times have you observed the Devil's River and the Pecos?

A. Seven or eight times, I should think.

Q. And your general observation is that the Pecos is a much larger stream?

A. Oh, yes.

Q. Have you ever seen the mouth of the Concho?

A. Never.

Q. How close to the mouth of the Concho have you ever been?

A. Never nearer than you get at the mouth of the Pecos, or the railway.

Q. How far is that?

A. I think seventy-five or eighty miles on the S. P. across to Presidio del Norte, where the mouth of the Concho is.

Q. How close is the Pecos to the Concho?

A. I can't tell you that.

Q. Do you know whether it is 200 miles?

A. Well, I could tell by looking at the map, which would be much more nearer than my offhand estimate.

Q. How do you know how much land are under irrigation on the Alamo?

A. I have not testified that I knew of lands being irrigated on the Alamo.

Q. Do you know whether there was any land under irrigation of the Alamo?

A. I have no knowledge, nor have I ever heard of any.

Q. How many times were you ever up its valley—I mean along the course of the river?

A. Well, I have crossed it at various places four or five times.

Q. Whereabouts did you cross it?

A. At Mier twice, and at a crossing below Mier since that I recall. I don't know as to any other time. It is not much of a stream.

Q. How far were the places apart at which you crossed it?

A. A matter of ten miles, I think.

Q. Can you swear that there is not a thousand acres in cultivation on it?

A. I don't think I could this afternoon.

Q. Can you swear that there is not five thousand acres in cultivation?

A. Can't swear anything about it.

Q. You do swear—

A. Not more than what I have already done.

Q. At how many places did you cross the Salado?

A. I have crossed the Salado, where it is the Salado, about three times, I think; and I have crossed the Salado, a branch of it, where the Sabinas came in, twice, I think—once or twice.

Q. At what distance apart did you cross?

A. The places where I crossed—it was on the way to Cerralvo—must be forty and possibly fifty miles apart.

Q. How long is the fork of the Salado?

A. Well, it is a hundred miles, more or less. I should think a hundred and fifty.

Q. How long is the stream, including all of its tributaries?

A. Well, the Salado part of it ought to be two hundred miles long, and the Salado Sabinas part might be two hundred and fifty miles, I should think. The think the Sabinas part is longer than the Salado part.

Q. What is the population of it?

A. Of what?

Q. Of the Salado and its tributaries?

A. That would be very difficult to say.

Q. Are there any towns along it?

A. Yes; the Salado part rises near Monterey, flows near Cerralvo and other towns, and covers quite a valley, while the other rises in the Coahuila Mountains and flows by Sabinas.

Q. Can you say whether there are ten thousand people on it?

A. Oh, yes; there are fifty thousand people in Monterey alone.

Q. I mean above Monterey.

A. I don't think the river starts as far up as Monterey—comes from in that neighborhood somewhere.

Q. Can you say whether there are one thousand acres, or five, or ten thousand acres in cultivation?

A. No.

Q. On the Salado and its tributaries?

A. On the Salado, I don't know anything of any cultivation. On the Sabinas branch, all I know, I have stated as to what I saw.

Q. There might be more than that there, so far as you know?

A. Yes; there might be.

Q. Might be twenty thousand?

A. I shouldn't think so. I shouldn't think it possible.

Q. Do you know whether the irrigation on it has increased or decreased in the past few years?

A. I do not.

Q. Isn't there cultivation around Monterey, near the Salado?

A. No; I don't think the Salado reaches Monterey.

Q. If you can't say whether there are ten thousand acres there in cultivation, how was it that on your direct examination you put it, or said that there might be two or three hundred acres?

A. I was speaking of that—of the Sabinas.

579 Q. Do you know what is in cultivation on the Sabinas?

A. No.

Q. Then, why did you say two hundred?

A. I spoke of what I saw when I visited the town called Santa Rosa, in the Sabinas district, and along the bank of the Sabinas River.

Q. As matter of fact, you haven't personal knowledge enough to say or approximate what the irrigation on the tributaries is?

A. On the Salado I know of none, and on the Sabinas I can only speak of what I saw.

Q. Then you haven't a comprehensive knowledge of the amount in cultivation sufficient for you to approximate it?

A. I don't think I have.

Q. The same thing is true also of the San Juan, isn't it; you haven't a comprehensive knowledge of it?

A. Any comprehensive knowledge; no.

Q. You say that you crossed the Concho at one time up near its head.

A. I have crossed it several times.

Q. Where?

A. It is near Santa Rosalia, in the State of Chihuahua.

Q. On the Mexican Central Railroad?

A. On the Mexican Central Railroad; yes, sir.

Q. Do you know what the name of the old town of Santa Rosalia is now?

A. There are so many Rosalias.

Q. You said near Santa Rosalia?

A. I only know it is a railway station.

Q. That is known as the headwaters of the Concho?

A. I don't think so.

Q. As a matter of fact, don't you know that the Concho flows nine

hundred or a thousand miles after it crosses the Mexican Central Railroad before it falls into the Rio Grande?

A. I don't know it.

580 Q. You know there is quite an irrigation there at the old town of Santa Rosalia, and several flour mills and fixtures, all supplied with water from the Concho?

A. I know nothing of that Santa Rosalia except as a railway station, and that somewhere along there I have seen the bed of the river.

Q. Don't you know, as a matter of fact, that the Concho River is one of the most densely populated agricultural sections of the Mexican Republic?

A. I know that the upper source of it, in the so-called Balson de Mapimi, has been in times past a very great cotton country, not so densely populated.

Q. In what direction is that section of the country from Santa Rosalia?

A. My impression is that it is to the south, and a little to the east. It is a large extent of country.

Q. You have no comprehensive knowledge as to the population or the cultivation in the valley of the Concho from its head waters, about its source and to its mouth?

A. I don't know that I have. I went to the Balson de Mapimi sometime early in 1880, and stayed in that neighborhood two weeks studying the cotton culture, and I only studied the cotton and incidentally the water supply as it affected the cotton on the river.

Q. Had immense plantations in cotton there at that time, did they not?

A. No; it was in a bad way. They have since had, and this season itself has been good, but they have, say, five years of good and five years bad, in that way.

Q. Just about like the Rio Grande?

A. Average so.

Q. Didn't you say in your direct examination that where you crossed the river there, there was irrigation on the Concho?

A. There was none that I noticed.

Q. At that railroad point, did you not have to go up to this point to get up the statistics of the cotton industry?

A. I came in over the Mexicano Internacional.

Q. To what point?

581 A. It was a point beyond the station that they then called Treviuno, where the Monterey and Southern connects with the Internacional. I am not sure as to the name.

Q. Monclovo?

A. No; further on.

Q. Were you ever along the course of the Rio Grande between Presidio del Norte and El Paso, Texas?

A. Never, except what we get along on the railway.

Q. Now, I want to ask you what is the distance by land and by river from Brownsville to Rio Grande City?

A. Well, I have never been able to find out. I was informed by signal officers that it was 110 miles; by others it was 105 by telegraph poles, and I have always concluded that the river was twice as long as by land. I found even Government reports didn't agree, so I can't be expected to be invincible.

Q. Now, how far was it from Rio Grande City to Laredo by land and by river?

A. I think that by land it is 120 miles.

Q. How far by river?

A. I don't know. The river is not so crooked when you get farther above Roma—that is, it doesn't have the sinuosities that it does have below.

Q. Were you ever along the course of the river above Del Rio?

A. Yes; to Devil's River and to the mouth of the Pecos.

Q. How far is it from Del Rio to the mouth of the Pecos?

A. A matter of 50 miles, I think. I am not certain. You can tell by looking at the map. I never carry those things in my head especially.

Q. How did you travel from Del Rio to the Pecos?

A. In an ambulance.

Q. How did you travel from Del Rio to Devil's River?

A. In an ambulance.

Q. And then from Devil's River to the Pecos?

A. Same ambulance.

Q. Along the course of the river?

A. No; we went by the road.

582 Q. How far was the road away from the river?

A. We started near the river, and then we left the river and came back to it again near Del Rio, as it was called then.

Q. Is there any place between Devil's River and the Pecos where you came even up with the Rio Grande travelling along the road?

A. No; not by that road I went.

Q. What is the distance from the Devil's River to the Pecos, you say?

A. Devil's River to the Pecos, as I recall, is between thirty and thirty-five miles.

Q. Now, isn't the railroad further away from the Rio Grande than that old stage road that you travelled; that ambulance or military road?

A. The railway between Del Rio and Devil's River goes for a considerable distance along the very bank of the river. When I went, in 1879, I did not see the Rio Grande from the time I left Del Rio, or San Felipe, as it then was called, until I got to the crossing of Devil's River, and then only by walking down the stream half a mile.

Q. And you didn't see it after you left the Devil's River until after you got to the Pecos, did you?

A. No.

Q. And you never have seen it between those points, have you?

A. Well, no.

Q. Then, how do you pretend to tell me the character of the flow that there is in there?

A. I was not aware that I had. I think you will find that my description stops at the Devil's River.

Q. You don't mean anything that you said then in describing the amount of absorption of the waters of the bed of the Rio Grande and its banks to apply to any part of the Rio Grande between Devil's River and El Paso?

Judge BURCH. He hasn't said *said* anything about the absorption, to my recollection.

Mr. HAWKINS. He has talked about the particular soil, silt deposits, and such things, now I am asking him if he means that apply to
583 the Rio Grande between Devil's River and El Paso.

A. Between Devil's River and El Paso, except what I saw at the mouth of the Pecos, and what I have seen in a little journey down from Juarez, El Paso, ten or fifteen miles.

Q. Is there any absorption down the bed of the Rio Grande below El Paso; I mean down below the city of El Paso, ten or fifteen miles, by means of the bed and banks of the Rio Grande?

A. I suppose so; I don't know anything about those things.

Q. As a matter of fact, you don't know whether that absorption is sufficient to extend out a mile or more from the banks of the river and affect the depth of water in wells, do you?

A. No; I wouldn't be capable of testifying on that.

Q. Do you know whether the depth of water in wells is affected by the height of water in the Rio Grande down below Laredo?

Judge BURCH. I submit that this is utterly beyond the limits of cross-examination. He is not assumed to be an expert; hasn't testified a word about wells, or outside the body of the stream, except that the stream overflows a long distance at one time. I submit that he is rather going beyond the limits.

The COURT. The examination of the witness was directed to the character of the soil in the lower Rio Grande, as to its quantities or absorbing the waters flowing in the stream. Now, I understand the cross-examination is directed to the extent of the absorption of the waters by the stream at these points.

Judge BURCH. I understand it to apply to El Paso.

Mr. HAWKINS. Oh, no; I said down below Laredo.

Judge BURCH. I will take the ruling of the court, if the court thinks it proper.

A. I do not.

Q. You don't know what the effect is, do you, so far as absorption and waters is concerned by the banks and bed of the Rio Grande below Laredo?

A. I never noticed any.

584 Q. Just answer my question' as I put them. Do you know?

A. No.

Q. You have never conducted any investigation of any character to determine the amount of absorption of the waters of the Rio Grande below Del Rio, by means of its bed and banks, have you?

A. Yes, sir.

Q. What character of investigation?

A. I had an eighth of an acre of ground at Laredo that I irrigated.

Q. And you are an irrigator of the stream?

A. No; from the city waterworks.

Q. And that is the extent of your investigation?

A. About an eighth of an acre one season—village lot.

Q. You pumped water, did you, out of the ground?

A. No; I took it out of the hydrant.

Q. And you intended that to be a serious answer to my question?

A. You said of any nature whatever.

Q. I am perfectly willing to let it stand that way. Have you had any conference with any of the Mexican authorities with reference to gathering testimony in this suit?

Mr. CHILDERS. We object to that. That is taking things too far.

The COURT. I will allow the question to be put.

Mr. CHILDERS. An exception.

A. With reference to gathering testimony, I can't state whether I have or not, but I will tell you all that has transpired.

Q. Just answer my question.

A. I will answer it in my own way, if the court will allow me.

The COURT. Answer it as you see fit.

A. I went to the city of Porfirio Diaz and to the administrador de aduanas, the collector of customs, Mr. Martinez, and said to him that I wished to obtain one or two Mexican citizens who had lived long in Porfirio Diaz and who had observed the river and could testify in this case. He called in his comandante del guardas, the chief of the guards, and said to me, Here is Mr. Olivares Valdez, I think is the name, who has lived here fifty years or more and can tell. I asked him if he would testify, and he said he would, and he said he would go to the other side of the river and his testimony, and then I asked them about others, and they told me of another gentleman who was a ranchman and had a farm outside and was a retired major in the Mexican army and a citizen of repute, and they thought he would also come. I included these two names in the lists of witnesses whose testimony was to be taken at Eagle Pass. That is all the solicitation I had with any Mexican authority whatever.

Q. Did you publish an interview—did you write an interview from yourself, which was published in the Laredo News recently, while you were down there gathering testimony?

A. I did not and have not seen one.

Mr. CHILDERS. We object to that.

The COURT. I can not see the competency of it.

Mr. HAWKINS. In this way: The witness has come here for the purpose of stating facts. He has gone on the stand and stated them. Now, what he has said or stated in a public interview may or may not be at variance with what he has stated here as a witness; and if so, we are entitled to bring it out.

Mr. CHILDERS. If it is upon that ground we withdraw the objection.

A. I have not seen the article and don't know what it contains.

Q. Did you write one for publication?

A. I gave some points to Justo Peña, but have not seen the article.

Q. Did you write it down?

A. Yes; I wrote down some memoranda at his request.

Q. Who was Justo Peña?

A. The son of the editor.

Q. You haven't seen that article since it was published?

A. I have not seen it; didn't even know that it has been published.

Q. Did you not in that memorandum which you wrote down and handed to him for publication state that the navigation of the river was practically of no consequence and a farce, and that the real object of this suit was to give the water to the citizens of El Paso and Juarez, Mexico, for use for irrigation?

A. No.

Q. Didn't state anything to that effect?

A. Not that I recall.

Q. Didn't you state that the object of the suit was to give the waters for irrigation to the people of El Paso and Juarez?

A. No.

Q. Didn't you state that it was the object to give them a fair proportion of the waters?

A. I don't recall any such expressions. I don't think I said anything of that kind, or wrote it.

Q. Will you swear you didn't?

A. I have no recollection, and don't think so.

Q. Didn't you state in that interview that the suit was in the interest of the building of the international dam at El Paso?

A. I think not.

Judge BURCH. This is for the purpose of testing the witness's recollection?

Judge FALL. For the purpose of impeaching him.

Mr. CHILDERS. That don't tend to impeach anybody.

The COURT. The motives which prompted the bringing of this suit is nothing that this court has anything to do with, or any concern whatever.

Mr. HAWKINS. That is all.

Judge BURCH. Is there anything you desire to explain?

The WITNESS. I think not.

And now, at this time, the further hearing of this case is adjourned until to-morrow morning, December 14th, 1889, at 9 o'clock a. m.

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DECEMBER 14TH, 1899.

And now, on this the 14th day of December, 1899, at the hour of nine o'clock a. m., the further hearing of this cause is resumed.

Present, the court and counsel, as before.

WARNER P. SUTTON, being called for further cross-examination, on being questioned by Mr. W. A. Hawkins, testified as follows:

Q. You know J. H. McGowan, a lawyer, of Washington, D. C.?

A. I do.

Now, I will ask, you have not in the past been the employed agent or attorney of the Government of Mexico, or its minister in Washington, with reference to the matters involved in this litigation?

A. I have not.

Q. Have you ever represented to J. H. McGowan, of Washington, that you did represent the Mexican Government with reference to the diversion of the waters of the Rio Grande, on the part of the people of the United States, and talked or converse' with him with reference to a plan and settlement of such difficulty?

A. Your question might be treated, perhaps—

Q. Well, answer as you see fit.

A. I have talked with Mr. McGowan in a general way about this case, and used—I don't know that I ever mentioned or said to him that I was the representative or agent of the Mexican Government.

Q. How long ago was it that you had that conversation with Mr. McGowan?

A. Well, I can't say; since the filing of this suit, I should presume.

Q. Was it since the filing of this suit, or while protests were pending in Washington against the suit being brought?

A. I should feel confident that it was since May, 1897. Mr. McGowan, I might add, is associated with me in certain cases—in partnership sometimes.

588 Q. Was he associated with you in this case?

A. No.

Q. Hav'n't you acted as the agent or attorney of either the Mexican Government or some of those officials, or some of the Mexican people, in presenting to the State Department at Washington, a protest against the diversion of the waters of the Rio Grande?

A. I think I can answer that no; but can put you on the track of what you are after.

Q. We'll follow.

A. I can help you out of your difficulty by saying that I have been the agent or attorney of Max Weber, of El Paso, Texas, and such others as he chose to have allied with him.

Q. I didn't inquire anything about Mr. Max Weber.

A. Not the Mexican Government. In the first place, if you will allow me to state it, in 1895—about the 18th of January, 1895—Mr. Weber, being a good friend of mine, asked me to speak to President Diaz about the alarming condition, as he alleged, of the Mexican agricultural interest in the Juarez Valley, and explain to him the claims that were then pending by Mexico or Mexican citizens, because of alleged diversion of water. I did so speak to Mr. Diaz on behalf of Mr. Weber. I acted as Mr. Weber's personal attorney, not as the attorney of the Mexican Government. Never have in any way acted as the attorney for the Mexican Government as to presenting anything in Washington. Hav'n't signed anything in the State Department. I don't think I have laid anything before the State Department. Never been anything more than the personal attorney of Mr. Max Weber.

Q. What interest has Mr. Weber?

A. I didn't ask Mr. Weber his business. I think he told me that he owned some of the lands, and perhaps was interested with others that owned lands.

Q. He asked you to speak to the President of the Republic of Mexico about the situation?

A. Yes, sir.

589 Q. You represented him—that is a mistake—as his attorney?

A. For that one purpose and none other.

Q. You continued your relation in the city of Washington, with Mr. Weber, with reference to the same question, did you not?

A. In a sense, yes; not doing much of anything, but always ready to do anything if there was anything to be done.

Q. In what way?

A. In any way; anything that he wanted me to do, I would do.

Q. Did you have any relations with him in Washington with reference to this question—question of the diversion of these waters?

A. Since May, 1897, probably I kept him informed, so far as I was aware, of the filing of the suit. Nothing beyond that, I don't think.

Q. Did you take any part in the filing of claims against the United States Government on account of damages which it had done to Mr. Weber or other citizens of Mexico?

A. I was not aware that any such have been filed.

Q. Don't know?

A. I am not aware that any have ever been filed.

Q. Did you present anything with reference to such damages to any of the departments in Washington?

A. No, sir.

Q. Don't know that any have been filed, or if any have been filed, you did not present them?

A. No, sir.

Q. Your connection with this case dates several years back of your employment by Judge Burch?

A. My indirect connection with the proposition of a dam, or an increased supply of water, dates from my action in January, 1895, as Mr. Weber's personal attorney.

Q. And what was the particular proposition that you were to advocate before the Mexican authorities in Mr. Weber's interest with reference to water of the Rio Grande?

A. He wanted some certain water supply. Was not particular as to what it should be, but urged that they should have a water supply as in former years.

590 Q. Did you present any particular project to the Mexican authorities, or plan, with reference to obtaining Mr. Weber a water supply?

A. No.

Q. Did you not suggest or advise the building of a dam at El Paso, or procure one built?

A. Well, now, from 1895 to 1899, it is a little difficult for me to recollect or recall in a moment all I said to President Diaz and Mr. on that subject. My general impression is that I suggested what would be more proper, that they should discover the proper means to affect the result, and that I merely wanted to call their attention to the condition in which they represented themselves as being. I don't think I would presume to advise President Diaz as to what he should not. I am not in the habit of doing that.

Q. Did you have any conversation with Minister Romero at Washington with reference to this water proposition at El Paso?

A. I spoke to him once or twice.

Q. When was that?

A. In his lifetime. Between the filing of this suit and his death.

Q. Long before you were employed by Mr. Burch in this case, was it not?

A. Oh, yes.

Mr. HAWKINS. That is all.

Redirect examination:

Questioned by Judge M. C. BURCH. So far as the prosecution of this suit is concerned, did you ever have anything to do with it, the beginning of this suit—inspire the beginning of it?

A. No; not in the least.

Q. Had your relations with Mr. Weber practically ceased before you were employed in any way in this suit?

A. They had entirely ceased. I had been paid my fee, and there was nothing more to do, but of course I would always feel bound, if he had asked me to go on, to do so.

591 Q. You may now state the circumstances under which you were employed in this suit.

A. I think sometime last summer you came to my residence in Michigan, and stated that this suit had been entrusted you, and that you would come down to this country soon, and made some inquiries as to climate, distances, and all that; and you yourself finally said that if it should be necessary to ask me to assist you, would I accept the position and come and help you, and I thought a few moments and I said I would. I didn't do anything more, or said nothing, until near the first of October I received a letter from the Attorney-General asking me if I would serve in this case, and you yourself wrote a similar letter at the same time, to both of which I replied accepting, and held myself at your orders to come, and did start on October 23rd.

Q. Wasn't, as a matter of fact, your employment urged by me upon the ground of my lack of knowledge of the country and its different conditions and as a matter of friendliness to me personally?

A. I think it was.

Q. Your employment, so far as compensation is concerned, was almost nominal, was it not; that is, considering the range of fees that you have ordinarily received for your services?

A. Yes, sir; I think I should loose it if I hunted for it very hard.

Q. Anything more about the relations with Mr. McGowan? You are personal, very warm friends?

A. Very warm, indeed.

Q. He represents this defendant company?

A. He did so represent them; I don't know if he still does. He has also represented me. Have also been codefendants in other cases.

Q. So, while you are warm friends, you are opposed to each other in this suit?

A. I have no personal interest, and we joke one another about it, for the reason that he has been my attorney, and in other cases we have been attorneys together; that is all.

592 Mr. SUTTON. I would like to state as to a question asked me yesterday. I was asked yesterday whether I knew or had a conversation with Mr. Roberts and Mr. Hawley, and didn't recall either of these names. I said I did not think I had, but one of their names I recall this morning and presume that you did mean Mr. Ed Hawley, whom I do know.

Mr. HAWKINS. At the time you were employed in this case, what was the scope of your employment, as an attorney or a witness?

A. As a witness.

Q. You say that Judge Burch came to you and asked you if you would come here to assist him as a witness, and you thought a moment and said yes, and that nothing further was said about the matter. Did you mean to say that you didn't reveal to Judge Burch that you had a personal knowledge of circumstances and facts, which you detailed here in evidence?

A. I don't know exactly what you mean; I don't think I reserved anything from him that he had a right to know.

Q. Did you state the full conversation to us to-day—that he asked you to come, and you thought a moment and said yes, and that that was all the conversation that occurred between you?

A. That was the close of it, but we had gone over the matter; I don't remember how fully.

Mr. HAWKINS. That is all.

PHILLIP E. HARROUX, another witness called on behalf of the Government, having been duly sworn to testify the truth, etc., and being examined on direct examination by Judge M. C. Burch, testified as follows:

Direct examination:

Q. What is your age?

A. Thirty-three.

Q. Where do you live?

593 A. In Albuquerque, N. M.

Q. What is your business?

A. Civil engineer.

Q. By profession?

A. By profession.

Q. And practice?

A. And practice.

Q. How long have you been engaged in that capacity?

A. Since 1889; although my first work began in 1884.

Q. How long have you been engaged in that business in the Territory of New Mexico?

A. Since, with some exceptions, during, I think, 1890 and 1891, when we were in Colorado and Utah, I have been engaged in the practice of the profession up to the present time, from 1889.

Q. Have you at any time been engaged for the Government of the United States, in any capacity—any professional capacity?

A. I have.

Q. Please state the nature and extent of it, and the time over which the employment occurred.

A. Since 1895; I think the latter part of January—the latter part of January, 1895, I have been engaged in investigating the question of stream flow, and to a certain extent certain reservoir sites, on behalf of the Division of Hydrography of the United States Geological Service.

Q. Under Mr. Newell?

A. Yes, sir.

Q. Frederick H. Newell?

A. Yes, sir.

Q. Whereabouts did you perform the duties in which you were engaged? Well, let me ask you was that a regular salaried position, or did you receive pay for what you did merely?

A. There was no salary attached to it, and the pay was simply nominal.

594 Q. Then, it was nothing that bound you entirely—your services to the United States Government under salary?

A. Not in any way.

Q. Whereabouts were the duties assigned you by Mr. Newell to be performed mostly?

A. Mostly within the Territory of New Mexico, and as far down as El Paso, Texas.

Q. On what stream?

A. In the Rio Grande and certain other streams in the Territory.

Q. Tributary?

A. Tributary, and some also in the Colorado drainage.

Q. What does that mean?

A. The drainage of the Colorado River on the east side of the Santa Fe Range—Santa Fe and Taos Range.

Q. In that capacity did you compile data for the Department of Agriculture survey bureau?

A. I did.

Q. Did you take measurements and prepare data of your own in addition to compiling it for other parties?

A. I did.

Q. And on the Rio Grande River and its tributaries in New Mexico?

A. Yes.

Q. Will you state, in your own manner, if you please, to the court where you performed your duties; that is, at what particular points? In other words, give a general description of your duties and the stations for measuring, and matters of that kind. Just give a general recital, so that the court may understand, and counsel, what you did.

A. The work as organized wholly comprises the investigation of the flow of the streams, and particularly that of the Rio Grande. There were established some four stations along the Rio Grande at which measurements were taken for the determination of this flow. These stations were at Embudo, just below the cañon, south of the Colorado line, and at the upper end of White Rock Cañon; in the south of the Española Lower Valley; again at San Marcial, and also at El Paso, Texas.

595 The work in general consisted of the reading of gauges daily, gauge heights which were taken by observers stationed at these points, and also the actual gauge of the stream in order that the flow for certain heights might be obtained, and from these gaugings and gauge heights was computed the discharge passing these various points. That is a summary of the work undertaken.

Q. During the time you speak of, did you have any employment from the Territory of New Mexico?

A. I did.

Q. State what that was, and what the nature of it was.

A. That was an employment by the Territorial commission of irrigation and water rights—investigating the present condition of the irrigation and water supply in the Territory of New Mexico.

Q. In that work, did you prepare any report?

A. I did.

Q. Was it printed?

A. It was printed; yes.

Q. Whether the results of your labors for the Government of the United States were afterwards printed, that you know of?

A. They were.

Q. Will you state where, and in what form?

A. The printing of the data collected on behalf of the Government of the United States has been printed in several bulletins and their annual reports issued by the Department.

Q. Do you know of document known as 229; Senate Document 229 of the United States Senate of the 55th Congress, 2nd session?

A. I do.

Q. This book here? [Indicating.]

A. Yes.

Q. To whom was that data handed over by you—to whom did you give that data; that is, in 229?

A. That portion which was collected by me was transmitted to Mr. F. H. Newell at Washington.

Q. But did you also furnish some of it to somebody else—Mr. Follett, for instance?

A. I don't remember whether I furnished a portion of the data—a portion of the data was furnished to Mr. Follett direct, but I can't distinguish between that which was furnished to him direct and that furnished to Washington.

596 Q. But you did furnish data in regard to the flow of the water at different stations in New Mexico and as far south as El Paso, Texas?

A. I did.

Q. Have you the book or report which you prepared and in printed form by the Territorial government?

A. I have.

Q. Will you produce it?

(Witness produces book. "Territory of New Mexico, Report of Commission of Irrigation and Water Rights, December 15th, 1898.")

Q. I don't know where to find it; but will you find in that book a profile which you made—sort of a graphic description, showing the flow of the river here?

A. These are the profiles [referring to profile sheets in back part of report referred to].

Q. Is there more than one?

A. There are eight of them, I think—seven or eight.

Q. They are embodied in that book?

A. Yes.

Q. Have you several copies of that book?

A. I have.

Q. Now, will you state to the court from what you prepared that profile, or what do you call it?

A. It is a graphic representation of the daily flow of the river.

Q. Showing the height and depth, etc.?

A. Showing its flow action.

Q. From what did you say you prepared that profile?

A. The profile since 1895 has been prepared from the data which I have collected myself. Prior to 1895 it was prepared from the data furnished by the records of the office of the Division of Hydrography of the United States Geological Survey.

Q. Now, will you just, if you have more than one copy of that book, tear out these profiles?

A. I have only this copy here.

Q. But you can tear it out for the present purposes without destroying the profile if you can. Will you step to the table and
597 put your initials and number each of them on the corner of the back?

A. (Witness tears out profiles, places initials "P. E. H.," and numbers profiles for years 1889 to 1897, inclusive, 1 to 9, respectively.)

Q. Now, will you open No. 1 and exhibit it to counsel and then to the court, and, when you have exhibited it to the court, explain the character and nature of it?

A. Each vertical line here represents a day of every month, and these are then divided into months by a heavy dark line, for convenience here, such as January, February, March, and so on. Each horizontal line, as shown by the red line, represent the discharge of the stream in cubic feet per second; that is, if I recollect correctly, this distance is one inch. This is also one inch, and every inch means 2,000 feet cubic feet per second discharge for each inch of elevation. As we rise, the flow is taken and shown graphically on this horizontal and vertical scale with these propositions, so that it may be read daily through the year.

Q. Now, Mr. Harroun, from what did you compile, or get the information you made this graphic description, as it is called?

A. This No. 1 is the year 1889 and was compiled from the records furnished me by the office in Washington.

Q. Is the data connected with that anywheres in print?

A. It is.

Q. In this book?

A. Summary of it is in this book.

Q. Where is the rest of it? I mean the daily——

A. I have a copy of the daily.

Q. Where is that?

A. (Witness produces records.) The daily flow is in this manuscript
copy.

Q. You have the copies there?

A. Yes.

Q. Now, then, you have a summary in this report?

A. The summary is in there.

Q. Will you mark the papers and name then—refer them to the report where the summary is?

A. The summary of this data from 1889 to 1897 is contained
598 in pages 66 to 73 of this report. (Report of Commission of Irrigation and Water Rights, December 15th, 1898.)

Mr. HAWKINS. You haven't identified the report yet.

Judge BURCH. Thank you; I will do it in time if you will give me a chance.

Q. Read the title of the report.

A. Report of the Commission of Irrigation and Water Rights, December 15th, 1898, Territory of New Mexico.

Q. Will you put your initials and, say, the figures "9" on the corner of that book?

STENOGRAPHER. That will be 10.

Q. Well, then, No. 10.

A. (Witness affixes initials on upper corner of report referred to, together with No. "10".)

Q. Will you mark with your initials the pages of that book also, that you have called attention to—putting your initials on the corner of each page that you have referred to?

(Witness affixes initials to pages 66 to 73, inclusive, referred.)

Judge BURCH. Now I offer in evidence, if it pleases the court, the pages just referred to of this book, and also these eight or nine profiles, or whatever they may be termed.

Mr. HAWKINS. Now, if the court please, I don't like this system that the counsel has of trying to present the evidence on one given subject. The pages which have been referred to are not the only pages in that book which bear upon the facts which are tre'd of by these particular pages. There are other pages there that bear on the same thing exactly—measurements by this witness, statements of fact by this witness with reference to exactly the same subject, covering the whole or at least a portion of the matter described in these pages, which show—that is pertinent to the issue involved here, which are not included within these pages at all, and I think if he is going to present expert investigations of this

599 witness in this kind of form—if he is going to undertake, for a purpose which I don't understand, to put in the evidence of the witness in the shape of a treatise, when he has go' the witness in the chair himself with his original data and memoranda, all in his possession, that I particularly object to. If he is going to do it that way, then I understand that every page of that book which refers or bears upon this work must go in as exhibits. I would waive the rule of letting the distinct pages only be put in evidence only upon condition that all the pages that bear on the facts should go in.

(Argument of counsel pro and con.)

The COURT. Is the data in these pages of this book composed entirely of matter furnished you by the Geological Survey?

WITNESS. It is based entirely of data furnished me by the Geological Survey, and my own investigations.

The COURT. And the data contained in these pages is represented by these plates now proposed to be offered?

A. They are.

The COURT. The objection will be overruled.

(Exception by counsel for defendants.)

Q. (Examination resumed by Judge BURCH.) Do I understand that these contain substantially the details of what the pages are a summary of—these papers which you have? Explain what these are.

A. This is a record of the daily discharge or daily flow of the Rio Grande passing the various points which I have enumerated. This is the detail [referring to daily records, not yet introduced in evidence, but in witness hands] of which these pages in that report are a summary. These hydrographs are a pictorial representation of the figures found in this mass of statistics. They are exactly the same thing.

Q. Do I understand that you can spare them from your office?

A. Part of that data I have no other copy of.

Q. Have you copies of these anywhere?

A. Part of these I have no copy of.

600 Judge BURCH. We can use them here, and after the trial is over, substitute copies for them, so that your original may be returned to you.

Mr. HAWKINS. We would have no objection to that.

Q. (By Judge BURCH.) What would you call these; daily reports?

A. Daily reports of river flow—flow of the river.

Q. You may mark them and number them consecutively for identification.

(Witness affixes initials to daily reports.)

Cross-examination by Mr. HAWKINS, upon admissibility of reports:

Q. When were you furnished with these by the Department?

A. My recollection is it was somewhere about eighteen months ago.

Q. Didn't they come up subsequently to eighteen months ago?

A. I think not. That data was asked for in the compilation of this report which I made. Report to the Territorial commission of irrigation and water rights.

Q. Whereabouts are your headquarters?

A. Albuquerque.

Q. How many observers have you under you?

A. Three.

Q. Where are they stationed?

A. Embudo, Rio Grande, and San Marcial.

Q. Do you take the observations at El Paso?

A. No; not now.

Q. Are they under you?

A. No; not now.

Q. Have they ever been under you?

A. During 1895 and 1896, and up to about May, I think, 1897.

Q. Who is your observer at Embudo?

A. A. H. Wasson.

Q. Where does he live?

A. At Embudo.

Q. What business is he in?

A. He is station agent for the D. & R. G. R. R. Co.

Q. How far is the station building from the river?

A. About one hundred yards.

601 Q. How often does he make reports to you?

A. Twice a day always, and sometimes more frequently, when there are violent changes in the river.

Q. Written or telegraphic reports?

A. Written reports.

Q. How long has he been there?

A. I think about three years.

Q. How can he tell the velocity and flow of water in the stream at that place?

A. He can not.

Q. How can he make reports to you then?

A. He reports the gauge height to me.

Q. You have your gauge so set, then, that if you know the height of the gauge you can tell the flow of water?

A. Yes.

Q. Does he report the current, also?

A. No; not at all.

Q. You would determine the current from the level of the river—the fall of the river, as you know it to be at that place?

A. I would determine the discharge from the height.

Q. That would give you the velocity and every other feature necessary to determine exactly the amount of water flowing by there, would it?

A. Yes.

Q. How long did you say he had been there?

A. About three years.

Q. Who was there before him?

A. I don't remember the name, but I have it. I can give it to you from my record.

Q. Did the other man who was there before him make reports in the same way?

A. In the same way.

Q. Is that true of all these other stations that you have under your charge?

A. Yes, sir.

Q. Same character?

A. Same character.

Q. Reports made regularly?

A. Same system of reports all through.

Q. You in person fix the gauge and the other factors necessary for determining the facts which they report to you, on the ground?

A. I did in two instances—that is, at Embudo and Rio Grande. At San Marcial the gauge had been put in before I took charge. I should judge, perhaps, a week before.

Q. Did you ever test the gauges that you didn't fix?

A. Yes; I have been there.

Q. Check them up to see whether they had been accurately fixed or not?

A. Yes, sir.

Q. Determined that they had been, did you?

A. Yes, sir.

Q. Please explain to the court the method of ascertaining the amount of water passing a given point at each one of these stations.

A. We may take one station as a typical illustration of them all, for the same method is pursued. Take Embudo, for instance. At that point there is stretched across the Rio Grande a wire cable about five-eighths of an inch in diameter. On that is hung or suspended a car on pulleys, in which one may cross the river or reach any point over the river, as they may choose. Above this car and cable there is suspended an iron wire with tags on it every five feet, in order that the distance may be obtained. The gauge height is first read, and the car is entered and soundings are taken all the way across this river, and soundings and meter readings. These soundings give the depth and the meter readings give the velocity of the current, and from this current is computed the discharge of the river at that gauge height. That is a summary.

Q. So that if these various agents along the route at these stations report to you correctly the gauge heights then you can tell correctly the

amount of water passing the river at the time that measurement was taken?

A. Yes, sir.

Q. And if they were not correctly reported to you—the gauge heights—then the figures which you offer here are not correct; but if they are correct, then the figures which you offer are a correct representation of the flow of the river at those times?

A. They are.

603 Q. You, of course, don't know whether they made correct reports or not?

A. No; that is, in so far as I may not be absolutely sure, but in visiting these stations—I frequently visit them and did not meet these observers, and I, of course, took my own readings of gauge heights and compared them with their reports which they sent in. In that way there is a check against any error, and it also determines whether they are reported them correctly or not. That is necessary in order to provide against mistakes or other matters.

Q. You have no data with reference to the stations at El Paso which has been furnished you by the Department since eighteen months ago?

A. No; since about a little over—about two years and a half ago. I think it was May, 1897, that I ceased to take the record at that point.

Q. And yet this picture—one of these pictures which you gave to the court here as being an exact representation of data—which has either been furnished you by the Department or compiled by you yourself, reports the flow at El Paso.

A. I didn't quite get your question.

Q. (Question repeated.)

A. As I understand the question, the representation of the El Paso flow is here.

Q. It is embraced in one of these pictures?

A. It is.

Q. Is it embraced in all of them?

A. It is so far as it is a matter of record—so far as I have the data up to 1897. This does not go beyond 1897.

Q. Does not go beyond 1897?

A. No; not beyond 1897.

Mr. HAWKINS. We will have no objection to the introduction of the reports.

Judge BURCH. We will offer these in evidence. Have you put any marks on them?

A. No, sir.

604 Judge BURCH. Number them in some way so as not to harm them in any manner, and they will be returned to you—will be withdrawn later on, so that you will not have any trouble about them.

Mr. HAWKINS. If they are withdrawn, of course we would like to have copies substituted.

Judge BURCH. That will be satisfactory. He can take them home and make copies of them.

Cross-examination, P. E. Harroun. Examined by Mr. HAWKINS.

Q. Mr. Harroun, what are factors in nature which tend to increase or decrease the flow of the Rio Grande in New Mexico in the parts which you have measured, and over which you have maintained a governmental inspection?

Judge BURCH. I object. We have in no sense sought to make this witness an expert for the purpose of answering hypothetical questions. He came here under pledge from us not to do so. He has testified merely to data and measurements that came within his personal observation. I object at his request and because it is not proper cross-examination.

Mr. HAWKINS. I am utterly astonished at any such objection. He is introduced as an expert witness here to testify to the increase and decrease in various months in various years in the flow of water in the Rio Grande at various places. Now, we are entitled to draw out the causes which have made certain measurements fall to a certain place on that gauge, or rise, as a matter of determining whether these have been accurately made or not.

The COURT. The examination of the witness has gone to the extent of showing an existing state of facts at certain points on this river—the fact that these conditions have been observed and recorded—and he here produces the result of those observations. He has not undertaken to testify as to any of the causes which operate to produce these conditions at any of these points, and has undertaken to have no knowledge except of completing the measuring and recording of what he saw at those
605 places; consequently the objection will have to be sustained.

(To which action of the court defendant's counsel then and there excepted.)

Q. You have been asked with reference to the report which you made to the irrigation commission of New Mexico as to the flow of water in the Rio Grande, and the summary which you had made thereof, and certain pages of your testimony being a part of that summary have been introduced in evidence. I would ask you if, as a part of that summary, ending with these tables or commencing with these tables which you have introduced, you reported to that commission anything further with reference to the flow of the Rio Grande and the measurements along the course thereof than is contained in these tables?

A. There was some reference to these tables in the text of the report.

Q. I will get at it directly. Were pages 75 and 75, as contained in this book, a part of your report to that commission?

A. They were.

Mr. HAWKINS. We now offer in evidence those pages under the rule which you forced upon us—

Judge BURCH. I haven't forced you any that I know of.

Mr. HAWKINS. —as a part of the testimony of this witness.

Judge BURCH. I believe the witness said that he prepared those two pages.

Mr. HAWKINS. Yes, sir.

Judge BURCH. I object to the introduction of so much of the pages offered as is comprised in what might be termed the "text." I do not object to that portion which is comprised in a certain table there, which pos-

sibly might have a relation to what has already been offered in evidence. The ground of objection is that it is not part of the cross-examination of the witness, but rather an expression of professional opinion upon his part, and on a line concerning which I have not interrogated him on direct examination, and therefore not proper cross-examination of the witness. I contend, if they desire the witness' services as an expert, and need an expression of opinion, they must subpoena him as their witness, compensate him as an expert, as the Government will undoubtedly be obliged to do, and use him as such at their own peril. That is the ground of objection.

The COURT. The objection will be sustained as not pertaining to the examination in chief.

(To which action of the court in sustaining the said objection, the defendant's counsel then and there excepted.)

Mr. HAWKINS. That is all.

W. W. FOLLETT, another witness called on behalf of the Government, having been affirmed to testify the truth, the whole truth, etc., and being examined on direct examination by Judge M. C. Burch, testified as follows:

Q. What is your full name?

A. William W. Follett.

Q. What is your age?

A. Forty-three.

Q. Your residence?

A. My legal residence, Denver, Colorado. Present place of business, El Paso, Texas.

Q. What is your profession?

A. Civil engineer.

Q. Whether you hold any official position?

A. I am consulting engineer on the part of the United States on the International (Water) Boundary Commission between the United States and Mexico.

Q. How long have you known the Rio Grande River?

A. Ten years—ten and a half years.

Q. From what points, and to what points—that is, within what limits?

A. Well, from Del Norte, Colorado, to a point, say, twenty-five miles below El Paso, Texas. A short portion of the river at Eagle Pass, Texas, and practically all of the river from Tomas, about twenty-five miles above Laredo, to Brownsville, Texas. Then I have seen it at a few places below Brownsville, but I have not traversed the whole of it between Brownsville and its mouth.

Q. You know the general contour and sinuosities—what you might call the geography of the stream—then, in those portions which you have mentioned as having actually seen?

A. Yes, sir.

Q. Whether you are familiar with its geography, as you see it in books, of course, maps, and all that, all the way down?

A. Oh, I have in my office—I have a photographic copy of the large map made by Emory and Salazar, in their boundary survey in 1852 and 1853. Of course I have looked that over a great deal.

Q. Familiarized yourself with it thoroughly?

A. Yes, sir.

Q. What now have you to say—well, I don't know whether to express it as typography of the stream or what, but what have you to say of its general character—that is, height of the banks, the character of the bed of the stream, and all those—what we would call it, well, I don't know. I guess perhaps you have got it as good as it could be put?

Mr. HAWKINS. Typography.

A. Well, it is a little more than the typography.

Q. Physical characteristics?

A. I believe the geologists have a term they call physiography (?) that means the physical characteristics of the stream.

Q. That would mean it?

A. Yes, sir.

Q. You are familiar with that?

A. In the portions I have seen.

Q. Certainly, that is what I mean. We will always consider it is the portions you have seen. Will you describe—will you explain or describe to the court, in a general way, the character of the stream, starting as near to the source as you have been and going down to Brownsville?

608 A. There is a great many different conditions, and I can't describe only short stretches of it at a time.

Q. Well, don't deliver a lecture. In other words, give the court a brief summary, so that he will know of it what he don't know already.

A. At and near Del Norte the stream is really a mountain stream, its bed is heavy gravel and boulders, and the mountain ranges on each side come close into it. A few miles below Del Norte it flows out again and into the San Luis Valley, and is larger, and, well, you might possibly call it a plain stream, although it has light gravelly banks—has gravelly banks probably six feet high—sometimes like that. And it contains in a channel like that until it reached the mouth of the Conejos, there the hills again come in. The mouth of the Conejos is probably fifteen or twenty miles above the State line between Colorado and New Mexico, and there the hills on each side again come into the stream. Still its fall is very little. Its fall is quite little from the time it enters this plain until it reaches the State line. There, there is a tremendous lava flow that crosses to the left. And the river begins to come down into the lava flow, which forms a cañon for 120 miles south of there. Twenty miles south of there it is four or five, or even six hundred feet deep, or something like that, and very rocky on the sides and in the bed, and the fall is very rapid. That cañon extends to about Embudo, where this upper station that Mr. Harroun has spoken about, is situated.

Q. Is that above the line of Colorado and New Mexico?

A. Oh, no; that is below the line of Colorado and New Mexico, thirty miles—no, sixty-five miles.

Q. By the sinuosities?

A. Measured along the axis of the river, not including the sinuosities, but measuring along the general course of the river, merely over the map. Then at Embudo it begins to spread out, flow all over the valley, and the stream becomes lighter, and its course more tortuous, and the

609 banks are alluvial deposit. Well, after you pass the mouth of Chama, above there, it is a little heavier, and then at the lower end of the Española Valley it enters what is known as White Rock Cañon—a box cañon some fifteen, ten or fifteen, miles long, with rock walls and rock bottom, with a good deal or considerable fall. Then after it leaves that it enters a valley which extends practically to about San Marcial, with one exception, a place above Socorro, about the mouth of the Salado. I think it is where the rock wall come in pretty close. That valley is anywhere from half a mile to four or five miles wide, and the stream wanders around through that in a very tortuous course, with banks sometimes—sometimes not over three or four feet high, and then they may be again five or six feet high. That extends to San Marcial, some one hundred and fifty miles along the axis of the river's course, not measuring the sinuosities. Then it passes around the Jornada del Muerto, which abuts on the river at San Marcial, and the river enters, well, we would call it a cañon. But there are little valleys lying along the foothills which come in and open up again. There are several little valleys down around there. At Elephant Butte, which is about half way down, it is in a cañon, and then a few miles below Elephant Butte it widens out again and there is quite a valley; a good many people living there, and some irrigation near Rincon and Seldon. Then in between Rincon and Fort Seldon it is again a cañon, but all the way now after you leave the White Rock Cañon above Albuquerque it is a sandy bed, with the exception of—I only know one place where there is rock that crosses the river; that is, to the best of my recollection, about ten miles, or fifteen, from Elephant Butte there. There is a rock reef that crosses the river, and the river just flows over the rock. That is the only place that I know of. All the rest of the way it is a sandy bed or alluvial. From, say, Fort Seldon, this immense valley begins and extends to possibly to the end of the valley below El Paso; all of the way it is the same kind of a bed, and below El Paso, as far as I have seen, it is the same way.

Q. About how far is that?

610 A. About fifteen or twenty—twenty-five miles, perhaps, by the axis of the valley, that I have been down in the valley of the river, with banks of about—well, from four to six feet high, excepting occasionally where there is some high ground abuts out into the river, where it may be twelve feet high. There is a place right below El Paso, on the Mexican side, where it is about twelve or fourteen feet high on the banks of the river, but there is only a few of such places.

Then jumping down to Eagle Pass, there the banks of the river are probably fifty feet high. They are right in front of Porfirio Diaz. Across from Eagle Pass there is a rock ledge in the bed of the river, so that while the bank on the Piedras Negras side is rock, on the Eagle Pass side it is rough gravel—coarse gravel, and with some sand in it.

Then at Santo Tomas the river, on the north side, on the Texas side, is quite a high plain, and on the Mexican side is some low ground that is said to overflow in extreme high water, but not otherwise. I will say in that connection that the river along all of these alluvial banks that I have described are practically liable to overflow at extreme high water, or portions of them; some of them are overflowed all the way down.

Then going down to—at the points I have seen between Santa Tomas and Laredo, the bed of the river is gravel, with some rock projecting into it at some places, ledges of rock occasionally.

Then starting at Laredo, on down to the mouth of the Salado, a distance of fifty-five miles following the axis of the river, or seventy miles by the sinuosities of the river, there are a great many high banks, anywhere from thirty feet, and I guess a hundred feet or more; the plains come right out to the banks of the river. There are many rock reefs crossing the river, and in many places the bed of the river is rock and in other places it is gravel, from the coarse to a fine gravel, and some places merges from the coarse gravel up into good big rocks. From the

611 mouth of the Salado, at Carrizo, to the mouth of the little river that comes in near Mier, thirty-five miles by the axis of the river or fifty miles by the sinuosities, the river bed is the same as it is above, only there is quite not as much rock into—not as many rock reefs, and the current is not quite—does not average quite as swift and perhaps the gravel gets a little finer.

From the mouth of the Loma River, which is near the town of Mier, Mexico—the town is situated up on the Lomas, a short distance from its mouth to Roma, a distance of five miles by the axis or eight by the sinuosities of the river—there is only two or three rock reefs that I recollect crossing the river, and the banks become more of an alluvial formation. The gravel disappears and their place being taken by a soft, fine deposit of clay and fine sand mixed.

From Roma to the mouth of the San Juan, or Rio Grande City, practically a distance of twelve miles by land or about fourteen miles by river, there is only one rock reef, but my recollection of that is not very distinct. I think there is one just above the mouth of the San Juan, and the banks are becoming lower and there is beginning to be an overflow section—an overflow bottom. Above there the water would not get out of its banks, as the banks are so high that they come right in close to the river, that is, speaking generally. Of course, there may be little places here and there along the river for a short distance where they might be low, and the river might occasionally overflow there.

Now, from the Rio Grande City to Brownsville, a distance of ninety-five miles along the axis of the river or one hundred and seventy-seven by the sinuosities of the river, is a fine alluvial deposit, quite friable and easily eroded by water, and shifting from one place to another—very rich soil; nearly all the land close to the river, especially the overflow in high water; extremely fertile when overflowed, so that there is moisture in the soil. That is the way they raise the crops—it is from the effects of the overflow—that is, the water overflows the land and it soaks in and they plant the corn and things as quick as they can, and it grows from the moisture deposited in the ground. The vegetation consists, in the bottoms, of ebony trees, of cottonwood—some cotton-

612 wood, and ebony, and oaks—some oaks, not very much, and some smaller bushes and trees that grow in greater quantities, that are indigenous to that section, but whose names I can't recall. I know the names when I hear them in Mexican, but I don't recollect the names of them now; and also the torneo, which grows here, or it is a species of mesquite. Then, on the high ground where it comes in and on some

of the ground where it overflows, but only at intervals, it is heavy mesquite timber and large mesquite trees.

Then, below Brownsville, at the points that I saw the river, it was practically the same as I have described as to the banks and their height as it was below Rio Grande City.

At Rio Grande City the height of the bank above low water in the river would probably average from, well, from fourteen feet up to sixteen—twelve to sixteen—feet, and, as you go down, these banks gradually become lower, so that at Brownsville there are only about twelve feet, and at the lowest point I was on the river below Brownsville—that is, probably within twenty miles, by the sinuosities of the river, to the mouth the banks are about ten feet high—something like that—and down there it is practically the same, except the height of the banks.

Q. Have you prepared from the maps of your observation the distances of this stream—table of distances on this stream?

A. I have. I have a copy of it here.

Q. Now, will you just kindly give it into the record, so we can offer the table itself?

A. I have given the distances between El Paso. This is a table of distances along the whole Rio Grande.

Mr. HAWKINS. I have no objection to that being introduced in tabular form, provided the witness has made the measurements necessary to determine these distances.

Judge BURCH. He has scaled the maps.

Mr. HAWKINS. Then, let it state, as prepared from maps.

WITNESS. I can state from what maps I prepared it. The distances in Colorado were scaled from the land office—as we call the
613 land office map of Colorado, issued by the United States Land Office in Washington—and the distances from the head waters of the Rio Grande—that is, the main stream—to Del Norte, measured along the axis of the river, not taking into account the sinuosities, was 80 miles; from Del Norte to Colorado State line, 65 miles; State line to Embudo, 65 miles; from Embudo to the upper end of the White Rock Cañon, 30 miles; from White Rock Cañon, the length of the White Rock Cañon, 15 miles; White Rock Cañon to Albuquerque, 50 miles (these are all nearest to the five miles); Albuquerque to San Marcial, 105 miles. When I struck New Mexico then I used the New Mexico land office map, issued in the same way by the Commissioner of the General Land Office in Washington.

Now, from White Rock Cañon to Albuquerque, 50 miles; Albuquerque to San Marcial, 105 miles; San Marcial to Elephant Butte, 40 miles; Elephant Butte to Fort Seldon, 65 miles; Fort Seldon to El Paso, 60 miles; El Paso to lower Texas, which is just below the New Mexico line. In fact, the corner of New Mexico is within three or four miles of El Paso. Now, the measurements are taken from the Emory-Salazar maps of the boundary survey made by the two Governments in 1853—1852 and 1853. I scaled these distances from the indexed sheets, as they were called. There are twenty-nine sheets, about [witness indicates with hands] about four feet by two feet in size, and then there are sheets called index sheets—which are on a much smaller scale, of course—which showed the river, and I scaled these distances from the indexed sheets.

Mr. HAWKINS. One minute about that survey—is that going to be introduced in evidence?

Judge BURCH. Not the maps; but I have the book here. The maps are published as a part of the book.

WITNESS. For some reason there are no copies of the maps. This copy I have is a photographic copy of the original maps, with everything on it—even with the signatures of the commissioners on them.

614 Judge BURCH. That book was a report made to the Interior Department by Major William Emory of that commission, and transmitted by the President to Congress, and by Congress made a public document, and then printed by the Public Printer, which supplies the rule exactly.

Mr. HAWKINS. I don't agree with you about the supplying the rule, but I probably won't object to the introduction of the book.

Judge BURCH. If there is any question about these measurements, let it go. I am only doing it for general reference of both court and counsel. If you don't care anything about this, I don't know as I care anything about them.

Mr. HAWKINS. I object to measurements taken by the witness. What size are those photographs?

WITNESS. Full size.

Mr. HAWKINS. How large?

WITNESS. Two feet by four; you saw them in my office. Those rolls that I got out and unrolled—don't you remember? Took out of the drawer and unrolled them.

WITNESS. Shall I proceed? From El Paso to the lower end of the El Paso Valley, and of course that point was a little uncertain, but I measured down as far as I could see that there was any valley land on the map, 80 miles; from the lower end of the valley to the mouth of the Concho River, 125 miles—

Mr. HAWKINS. What point was that lower end of the valley, Fort Quitman?

A. Below Fort Quitman. I measured until I could see that the mountains came right in.

Mr. HAWKINS. To the mouth of the Concho?

A. 125 miles.

Mr. HAWKINS. You didn't measure that in person?

A. No, no; I scaled it from the map. From the mouth of the Concho River to the mouth of the Pecos River, 250 miles, pretty well down to where the hill is there; from the mouth of the Pecos to the
615 mouth of the Devil's River, 35 miles; mouth of Devil's River to Eagle Pass, 65 miles; Eagle Pass to Laredo, 110 miles.

Now, from Laredo down I have traversed the river and seen what it was, and have had the Emory maps right along with me, and can identify point to point, little islands in the river, and plains and ranches and lots of things of that kind, and the sinuosities there of the river there comes out—does not shift. It is in a heavy formation, and does not shift, so that I could identify it all the way. So I have put in here the distances, not only along the axis, but the distances by the sinuosities from Laredo.

From Laredo to the mouth of the Salado River, 70 miles, axis 55

miles; from the mouth of Salado River to the mouth of Alamo, by the channel, 50 miles, and axis, 35 miles; from the mouth of the Alamo River to Roma, 8 miles by the channel and 5 miles by the axis; Roma to the mouth of the San Juan, 12 miles by the channel and 10 miles by the axis. Now, from this point to Brownsville, the distances along the channel of the river have all been accurately surveyed; from the mouth of San Juan to Rio Grande City, 12 miles both by the channel and by the axis; from Rio Grande City to Brownsville, 177 miles, by me surveyed, and the survey of the Mexican commission, and 95 miles along the axis of the river; from Brownsville to the mouth of Rio Grande, 85 miles by the channel of the river and 30 miles along the axis of the river.

Judge BURCH. If there is no objection, I ask that you put a mark in its regular order; you may put your initials in the corner, and I will offer it in evidence.

(Table referred to by the witness marked with his initials "W. W. F." and designated "No. 1.")

Judge BURCH. Now pass that to the court and we will offer that for what it is worth.

Q. Were you present in court yesterday, Mr. Follet, so as to hear the testimony of Mr. Albert Thornham?

A. I was.

616 Q. I desire to know if you are acquainted with the Red River of Louisiana and Arkansas?

A. I am.

Q. State what your acquaintance amounts to.

A. On June 5th or 6th, 1883, I went to Shreveport, Louisiana, and took charge of the construction of a railroad and highway bridge across the river—across the Red River at Shreveport. I remained in charge of the construction of that bridge for about a year and a half—until it was completed. After the bridge was built I remained in Shreveport, working for the railroad company who owned this bridge, for about a year and a half. I had an office in Shreveport up until some time in March, 1886, and was doing general engineering work, but most of the time along the river, making surveys of the Red River. I know I made a survey and map of the river for some 120 or thirty miles below Shreveport. I also, during that time, made one trip on a steamboat from Shreveport to New Orleans, and another trip from Shreveport down to the lower end of Cato Parish, which was about 120 miles by river, and I also made a trip on the steamboat up the river into Arkansas, a short distance across the line. I don't remember the distance.

Q. A short distance below Fulton?

A. I don't know; not very far from Fulton.

Q. Was it as high up as Garland?

A. Not as high up as that; I don't think there was any Garland City there when I was in that part of the country.

Q. Now, you have already stated your observation of the Rio Grande River in regard to its physical characteristics; have you seen that river between Rio Grande City and Brownsville at different stages of navigation?

A. Well, I have seen it at a time when the river was pretty low.

There was one time when I was down there a rise of about four feet came down the river, but the rest of the time the river was nearly at low water.

Q. Now, you are acquainted with the Red River during your
617 two or three years that you lived upon it?

A. Three years, practically.

Q. Three years' practical experience on the Red River and navigation on that stream?

A. Yes, sir; I have seen it.

Q. Now, I would like to ask you whether there is—what, if any, resemblance there is between the two streams?

MR. HAWKINS. Now, if the court please, this matter was incidentally touched upon yesterday, and wasn't objected to, and was brought out by the Government, and we saw no reason at that time to object to it, but if it is to go into this record and this record is to be made by comparison between streams as a feature of the trial of this cause, as it now seems apparent, we wish to enter an objection on this line. The Government is here with its witnesses to testify as to whether there is navigation of the Rio Grande down near its mouth and the character of that navigation. It is for the court to say whether that is navigation within the protection of the law, as determined by the facts of the Rio Grande itself, and if it is navigation within the protection of the law it will depend purely upon itself. The comparison of that river with some other river has no proper place in the trial of this case. I do not think it is proper or pertinent, and therefore we object.

(Argument.)

THE COURT. After the facts are in, about the condition of the Rio Grande River, this court will have to determine, as a matter of law, whether it is a navigable stream. What the conditions are on any other stream, it seems to me, are immaterial. The objection will be sustained, at least at this time. If you care to urge this class of testimony further I will hear it some other time—a renewal of the offer, if you have anything further to say on the subject.

Judge BURCH. We will take an exception to the decision of the court and its ruling.

Q. Mr. Follett, did you have any supervision or control or
618 management of the measurements of the waters of the Rio Grande River at any point?

A. I have.

Q. Where?

A. At El Paso.

Q. When did it commence, and what time did it run?

A. The gauging stations at El Paso was placed under my charge the first day of May, 1897.

Q. 1897?

A. And is still under my charge.

Q. At this time?

A. Yes, sir.

Q. During that time have you compiled the measurements, etc., of the station there?

A. I have.

Q. And have you them?

A. I have.

Q. Are they with you?

A. Yes, sir.

Q. Can you produce them?

A. I can not produce them for filing in this court, unless I make copies, and haven't any blank books to make the copies.

Q. Well, can you produce them so that they may be withdrawn afterwards and copies substituted?

A. Well, I presume so. I didn't bring them up for that purpose. All of them are my private records of my office. Of course, copies can be made.

Q. You have a summary of these reports, have you—that is, you have them tabulated?

A. Oh, yes; yes, sir.

Q. You have a summary of these reports from that time down to the present time?

A. Yes, sir.

Q. You have compiled a summary from the reports themselves?

A. Yes, sir.

Q. You can let the summary go, couldn't you?

A. Oh, yes; I prepared that.

Judge BURCH. These for reference of counsel. On cross-examination you can let him have the original data, and it will be sufficient for that purpose. Is there any objection of counsel to that?

619 Mr. HAWKINS. I beg your pardon, Judge.

Judge BURCH. He says he has a summary of the reports of the gauging station at El Paso, and he has the original entries in his book, which are private records of his office, from which he has compiled the summary. Now, I was going to offer the summary in evidence, and also, for temporary purposes of this case, the books, and let them be withdrawn and substitute copies.

Mr. HAWKINS. We will be satisfied to let Mr. Follet make a copy of them, as far as that is concerned.

Judge BURCH. I then offer in evidence the summary. You may mark it with your initials, and No. 2.

(Document introduced being entitled "Statement of flow of the Rio Grande at El Paso, Texas, since new gauge was established May 1st, 1897." Marked "W. W. F. No. 2.")

Judge BURCH. I also offer temporarily the gauge books, which are to be withdrawn afterwards and copies substituted.

Q. I wish to ask you, you have heard the testimony of P. E. Harroun?

A. I have.

Q. Have you seen the graphic profile, or whatever it may be termed?

A. Hydrographs, I believe.

Q. That the proper term?

A. I have.

Q. And have you figured upon them to some extent, Mr. Follett?

A. I have taken some measurements from them and made certain deductions from them.

Q. Will you look at the six or eight copies, and see if they were the same ones from which you figured?

A. They are the same printed copy—they are printed from the same plates.

Q. From the same book?

A. Yes, sir.

Q. Have you, since your arrival here, taken pains to fortify certain summaries with the figures in that book, from which this was taken?

A. Yes, sir.

Q. You have done that?

A. Yes, sir.

620 Q. And you find them to correspond?

A. I do.

Q. State whether you have prepared any table of the estimated flow of the Rio Grande at certain points along the river here during the last ten years?

A. I don't quite understand your question, Judge.

Q. Have you prepared a certain table of the flow of the waters by months?

A. I have prepared a table. I will read the heading of it, which will show just what it is. (Witness reads:) "Statement of time it would have taken all the flow of the Rio Grande to have filled the Elephant Butte Reservoir, supposing it to hold 253,000 acre feet, during the maximum flow in each year—from El Paso gauging station." Except as mentioned in the course of the table.

Q. That is just from El Paso gauging station?

A. Yes, sir; except in two cases, when I used the San Marcial record, because there was no El Paso record.

Q. Then you have calculated how long a time it would take——

A. The entire flow.

Q. —the entire flow—flood flow of water passing El Paso station, except during certain years when there was no record at the El Paso station, and then from the San Marcial station—to fill the Elephant Butte Dam, upon the supposition that the Elephant Butte Dam had been constructed and would impound the amount of water mentioned in defendant's prospectus of eleven billion seventy-two million feet, or 253,370 acre-feet?

A. Yes, sir; I have called it in round numbers 253,000 acre-feet.

Judge BURCH. I will state for the benefit of counsel, that is year by year.

WITNESS. Yes, sir.

Judge BURCH. Now I have, for the benefit of counsel and the court, asked the witness to prepare this table, and the witness could either read it or testify as to the computation, and we will then put the
621 record of that computation in evidence, or he can just use the table.

The COURT. That includes the entire flow of the dates mentioned?

A. All that passes the El Paso gauging station.

Mr. HAWKINS. That doesn't so state, Mr. Follett. It says statement of time it would have taken all of the flow, etc.

Judge BURCH. That is the highest point for each year for so many days—when the flood is at its highest.

The COURT. That is, taking the river at the period, at its highest point, flowing at that rate, it would take so long to fill the defendant's dam.

WITNESS. What time elapsed during certain dates.

Mr. HAWKINS. There are several hundred miles intervening between El Paso and Elephant Butte, or more than a hundred—125 miles the general statement is for the distance between these points—and as we all know, there are various tributaries which enter the Rio Grande. There is absolutely no testimony with reference to any amount of water which would come down any of these tributaries, and yet this is offered—

Mr. CHILDERS. That goes to the effect of it. It would be modified by anything that may be shown to come from these tributaries.

Judge BURCH. Part of them are near San Marcial. How far is San Marcial from Elephant Butte, as near as you can determine?

A. Forty miles by the axis of the river's course.

The COURT. I suppose any unit might be taken from which such a computation might be made, and which does not go to the admissibility of it.

Mr. HAWKINS. But in the first place, the table is not admissible in this shape. The witness is here and can testify. Now I might admit for convenience a table of this kind and in this shape, and the only thing I want to be sure of is, in my endeavor to expedite the hearing, that I shouldn't place the defence in any position of disadvantage which I might otherwise have. We will let it go along.

Judge BURCH. Will you put your initials on it and number it?

622 The COURT. I understand that it is admitted; it will go in without reading.

(Witness affixes his initials and number to document referred to., i. e., "W. W. F., No. 3.")

Q. Have you made a computation upon the same basis of actual measurements at these same stations of the time it would have taken all of the flow of the Rio Grande to have filled the Elephant Butte Reservoir, supposing it to hold 253,000 acre-feet, during the first flow of water—flood waters I am now speaking of—of the stream. Taking above low-water mark, that is above the beginning stage, in these various years the first flow, and not the highest days of the flood—not the days of the highest flow, but beginning with the flow and extending back. For instance, suppose them to take the first waters that come down to fill the proposed reservoir at Elephant Butte and taking these measurements at El Paso and San Marcial during the past ten years as a basis, have you made an estimate which would show how many days it would have taken each year to have filled their reservoir before any waters would be allowed to pass by?

A. I have not.

Q. Well, something to that end?

A. I have made, though, an estimate supposing that they allowed enough to pass their dam to supply the ditches below it.

Judge BURCH. Then, upon the basis of the answer, I would suggest to the court I understand the witness to have made a computation and estimate, allowing for water to pass by sufficient to fill up the ditches to fill themselves along below the Elephant Butte Dam to the lower end of the El Paso Valley; that is, all waters that have heretofore been, as they term it, appropriated, of the time necessary each year to fill the Elephant Butte Reservoir. This compilation goes to the extent of the

number of days it would take to fill the Elephant Butte Reservoir from the first flood waters, and all the flood waters that come, until their reservoir is filled, and I desire to have the witness testify in regard to that computation.

Mr. HAWKINS. I think he ought to qualify the witness: There
623 has been no testimony as to what he knows about the ditches.

Q. Have you a knowledge of the irrigation ditches from Elephant Butte or from San Marcial, between there and El Paso Valley?

A. I have a general knowledge of them; yes.

Q. You have passed over them and made computations and measurements of them, so that you know about how much water they take—amount necessary to fill them.

A. I have seen them all, except one or two, and have estimated their carrying capacity.

Q. Will you give that estimate for the benefit of the court and counsel, if you have it here?

A. 217 ditches coming out of the river between Elephant Butte and Rincon, or Fort Seldon, whose carrying capacity aggregates about 295 second-foot; there are in the Mesilla Valley twelve ditches, whose aggregate capacity approximates 679 second-feet. There are in the El Paso Valley about seven ditches, or eight, whose capacity aggregates about 500, or a little more than 500 second-feet.

Q. Now deducting that amount—the amount necessary for that purpose—have you made this computation of which we have spoken?

A. I have.

Q. Now will you please—perhaps counsel would like to see that—or, I will take it year by year and you can testify to it, and then offer it in evidence, as you see fit.

Cross-examination of witness by Mr. HAWKINS as to competency of witness and relevancy of evidence.

Q. (By Mr. HAWKINS.) When did you make that ascertainment of facts?

A. As to those ditches?

Q. Yes, sir.

A. You want the exact dates.

Q. In the year.

A. It was in 1896—the fall of 1896—in October that I made
624 the ascertainment of facts down as far as El Paso. The El Paso I have obtained at various times when I have seen the ditches in the last four years.

Q. You know how many ditches are in existence at the present time between those points?

Judge BURCH. That wouldn't be material.

And now an adjournment of the hearing of this cause is taken until 2 o'clock p. m. of this 14th day of December, 1899.

And now at this the hour of 2 o'clock p. m. of the 14th day of December, 1899, the hearing of this cause is resumed, pursuant to adjournment. Present as before.

Cross-examination of Witness FOLLET, on his competency and relevancy of evidence, continued.

Q. (Last question asked before dinner repeated by stenographer.) You know how many ditches are in existence at the present time between those points?

A. I have not been over the country since October, 1896; presume they are all in existence, but have no actual personal knowledge.

Mr. CHILDERS. Since 1896?

A. Since October, 1896. As far as the ditches above El Paso, I know that from actual observation, that several of those in the neighborhood of El Paso are in existence. I know that this ditch is [referring to one at Las Cruces, about 100 yds. away from building in which hearing is taking place], for I saw the water running in it yesterday, but aside from that I have not seen it.

Q. Now this ditch that you have testified to—with reference to here—has it the capacity of the ditches that you are allowing for in 625 this estimate?

A. Now, I am allowing for quite the full capacity of them. I deduct some for water that I supposed would be lost. Knowing the capacity of the ditches, I take what I presume to be from my knowledge, I made an allowance that I thought would be sufficient to supply the needs for irrigation in these three valleys.

Q. It contained a measurement, did it, of the flow of the water in the ditches, and which they were actually carrying, the capacity of the ditches to carry waters, would it?

A. No; supposed capacities. I stated all capacities, but they were what were actually carried in the ditches, as near as I could make it; what was carried out during the irrigating season at the time I made my examination, as near as I could make it.

Q. How did you make the examination of these ditches?

A. Oh, in various ways.

Q. Did you go down the entire course of the ditch?

A. O, no. No, indeed!

Q. Where did you take the measurements as to its capacity?

A. Sometimes in one place, and sometimes in another, near the head of water—where the water was taken out.

Q. Near the head of it?

A. Yes, sir.

Q. Then the capacity of the ditch grew smaller down below the point where you measured the place; the place where you measured would not show the amount of water that would be ordinarily carried in the ditch, would it?

A. The ditch would naturally grow smaller as it was taken out.

Q. The capacity of the ditch is the smallest place before the water is taken out, is it?

A. Yes, sir.

Q. Then these ditches run away from their heads several miles before they were used for agricultural purposes.

Q. That is usually the case. As I stated in my statement, that 626 was estimated, that was to the best of my knowledge and belief of the capacity of the ditches, and I will modify that now by saying to the best of my ability it was estimated as to the amount of water that was passing through them for irrigation during the irrigation season.

Q. Well, now, will you please take up each one of these ditches and say at how many different places you measured that?

A. I can not do that; that is absolutely impossible.

Judge BURCH. That is more cross-examination than testing the witness's ability. This is simply as to his competency to make the calculation. I submit that this is not cross-examination for the purpose of this inquiry.

MR. HAWKINS. You are asking to submit a calculation, tabulated in tabular form as to apparent results.

The COURT. I think the question is competent as showing from what sources these results are obtained.

WITNESS. I have already answered it.

MR. HAWKINS. You can not figure out each one. Now, take any one of them and estimate how many times and at what point you measured it.

A. I say I can not do this. This was a reconnoissance that I made on horseback; taking up my information as I went through the country quite hurriedly, and is embodied in a report that I made, and I can't tell, take each one. Possibly I might pick out some one and recollect some particular place that I measured it, or something of that kind, but at this date—three years after that—I can not do it; can't answer your question.

Q. Is there any one of those ditches that you measured by actual measurement more than at one place?

A. I am sure I can't tell you. I think there were, because I made a number on that trip; estimated the capacity of a ditch about every time I would see it so as to check up my estimate of its capacity.

Q. You were on a hurried trip at that time; you were going down the river?

A. Yes, sir.

Q. And you would strike these ditches at their head and follow
627 the ditch down a short distance, would you?

A. Some of them I struck near the head and some further down, where they were used for irrigation.

(End of cross-examination conducted by defendants' counsel as to competency of witness, etc.)

MR. HAWKINS. What was your question that you were going to put to him?

Judge BURCH. I have asked the witness to make, and he has made, a computation of the number of days in each year, for the past ten years, it would take from the beginning of that flood to fill your reservoir—your proposed reservoir—if it had been built, after you had allowed enough water to go by to fill the already appropriated—what you term in your answer the already appropriated—water. In other words, you in your answer say that you did not expect and had no legal right to take the water already appropriated and used by persons who had previous to that time appropriated and used it, but you expect to take your water out of the storm flood and excess waters of the stream. Now, I have asked him to show how long, after allowing these previous appropriations that you mentioned in your answer—previously appropriated waters—after allowing these to go by, enough to fill these ditches that is to serve

these farms through these valleys below your proposed dam—how long after doing that it would take—it would have taken each year for the last ten years to have filled the measure of your reservoir in days by measurements that he has made. That was the proposition, to say how long the flood waters would be held up.

Mr. HAWKINS. Were these ditches running at the time you measured them?

WITNESS. Some of them. My recollection is, all of them were. I am not sure about that, though at the time I estimated the flow of them.

Mr. HAWKINS. Were there any permanent dams at the heads of these ditches?

628 A. Not that I know of; I didn't see any.

Q. Your familiarity with the river is such that you know that these dams are merely brush dams and go out with the floods, do they not?

A. Yes, sir.

Q. Then the amount of water that would flow down a ditch would depend upon the height that the dam crosses the river?

A. It might depend upon that, and the capacity of the ditch.

Q. Were these ditches down with the level of the river?

A. Why, certainly; they didn't pump any water in them.

Q. Didn't dams raise the water a little, to throw it into the ditches?

A. Some of them, and some simply diverted the water into the ditch.

Q. If these dams were out when the floods come, a larger amount would flow down the river than otherwise would?

A. Well, in flood times they don't need any dams; there is all the water they want, and good deal more will go into their ditches. It is only in low water that they use their dams.

Mr. HAWKINS. It seems to me that the fact is so involved that it can't be of any practical use. I don't want to make any captious objections in any way. As I understand, your question is the amount of water based on these calculations which have been submitted here as passing El Paso. From that amount is to be deducted the capacity of these ditches. Now, there is no evidence in here of any kind or character of the amount of water it takes to fill the ditches above El Paso—

WITNESS. I beg your pardon. When I used the El Paso gauging station I only used the capacity of the ditches below El Paso, and supposed enough would pass the El Paso gauging station to supply the ditches above, and supposed they would be running full, as they naturally would be, during the flood season. When I used the San Marcial, then, I made an estimate of the capacity of the ditches above and the amount.

Mr. HAWKINS. As I understand, you are testifying as to how many times this reservoir would be filled with water running down the
629 river during the flood period, after the subsidence of the highest floods.

WITNESS. No, your understanding is wrong. I hav'n't said anything about how many times the reservoir would be filled.

Mr. HAWKINS. What is this particular table?

A. I will read you the heading of it. "Time necessary each year to fill Elephant Butte reservoir, supposing it to hold 253,000 acre-feet, starting at beginning of spring flood, and allowing enough to pass to

supply all ditches below it, estimating this amount to be 500 second-feet for the El Paso Valley." That is for the first fill, and I have paid no attention to the flow after the reservoir is filled, but on the starting or beginning of the flood. When I had used San Marcial I deducted for the ditches intervening, and the amount of seepage.

Mr. HAWKINS. We won't object to it. We don't believe it is relevant testimony, but let it go.

Judge BURCH. Well, I will put that in.

(Paper referred to, marked with initials of witness, "W. W. F., No. 4.")

Direct examination continued:

Questioned by Judge BURCH. Mr. Follett, in your connection with the International Boundary Line Commission have you had occasion to examine the capacity of the Rio Grande River as to the water flow at different points between Rio Grande City and Brownsville, Texas?

A. Well, I have made a survey of the river down there—gathered data that enabled me to make a study of the flow. I have not had any occasion to make a study of that in connection with my duties as a member of the Boundary Commission.

Q. I speak of the capacity of the river for flood.

A. I say I have not had occasion to investigate its capacity for flood in connection with my duties with the Boundary Commission, but I have collected data that enables me to make a study.

Q. That answers the same purpose. Have you made a table of such capacity at the points below Rio Grande City?

630 A. I have.

Q. I wish you would state how you made that, and the manner of it.

A. Well, in the first place, I, from the records in my office, and the records of the survey that I made down there, made up a cross section.

Q. Explain what the cross section is.

A. I can explain it best, perhaps, by showing you what the cross section is. [Witness produces cross section referred to.] It is on a large scale, so that its quantities can be taken graphically from it. Now, here is a cross section of the channel of the Rio Grande one mile below Rio Grande City, Texas. This line here [indicating on map] represents the banks and the bottom of the river, coming on up to the top of the bank on each side. Then this line here [indicating] represents approximately the lower water. Some years the river may get lower than that, and some years it may not go quite down to that. Each space between the two dark vertical lines on the paper represents fifty feet. Each one of the horizontal lines is a foot on the scale I have used. From one of the heavy horizontal lines to the next heavy horizontal line is ten feet, there being ten fine lines in between; each one of these fine lines would then represent one-tenth of a foot in depth, while the vertical, each one of the fine lines represents one foot in width. For instance, on this cross section, at the estimate of low water, it is about 350 feet across—yes, about 350 feet across—while the depth in the deepest place is five feet. On that cross section, then, I have shown about 2 feet above estimated low water, the surface of the water on December 22nd, 1897, which was the day when this survey was made—the survey from which this is taken. Then up at the top, very nearly to the top of the banks, I have

drawn a line which shows the high-water level of the flood of 1897; that is sixteen and one-tenth ($16 \frac{1}{10}$) feet above the low water. That I have estimated, and its elevation is 152 feet above mean tide in the Gulf of Mexico.

MR. HAWKINS. That is not in response to the question.

631 JUDGE BURCH. I think it is. Now, by this cross section you mean a straight line run through the river from bank to bank—a vertical plane cut right across the river, and this showing the contour of the bank of the river from the top of the bank down to the bottom of the river, and around up to the top of the other bank?

A. Yes, sir.

Q. Now, then, have you computed the number of feet on that cross section in second-feet, or, as the case may be, required to fill that one foot above low-water mark, and two feet, and etc.?

A. I have.

Q. Have you made a table of that?

A. I have.

Q. Have you it with you?

A. I have.

JUDGE BURCH. I will state to the court the purpose of this examination and of this table. Our desire is to show what amount of water passing at a given time in addition to low-water mark, supposing the water to be at its normal or low-water mark, and a flood coming on—what amount of water it would take to raise the river one foot, what amount to raise it two feet, what amount to raise it three feet, four feet, five feet, six feet, and so on; in other words, how many second-feet it would take to raise the stream that much. That is the purpose of it, and we expect to have at least one other point, near Brownsville, where we have computed another cross section in the same way.

MR. HAWKINS. We don't object to that at all, provided this witness can qualify himself as to that cross section. Did you make that cross section yourself—the one represented on that map?

A. No, sir; they were made under my direction.

MR. HAWKINS. How far away were you when they were made?

A. My recollection is that at this particular place I stood on the bank when the soundings were being taken.

MR. HAWKINS. You can not swear to that?

A. I was in the immediate neighborhood, and the notes as taken each day were submitted to me.

632 MR. HAWKINS. Who were your subordinates?

A. The man that took the soundings across the river there and put them down in the record was named W. S. Steele, a leveller in my employ.

Cross-examination on competency continued by MR. HAWKINS:

You can not swear they are correct, can you?

A. Well, I can say I have every reason to believe that they are correct. I will say that I have every reason to believe.

Q. Do you know whether you can swear to that or not?

A. I don't care to answer the question, only to say that I believe they are correct.

Q. Whereabouts was the cross section taken?

A. About one mile below Rio Grande City.

Q. When?

A. On the 27th day of December, 1897—the 22nd day of December, 1897.

Q. How do you know what the high-water mark was?

A. We obtained the high-water mark from marks on the trees—from the trees and from the testimony of the inhabitants who would show us places—show my leveller. Sometimes I would look it up for him during the day. They would say, high water in June, 1897, or October, or whatever it was, came to this point on the tree, and my leveller would send his rod man there and—

Q. Who reported to you, the rod man or the leveller?

A. The leveller; his notes were turned over to me.

Q. Do you know who gave him the information as to these particular places?

A. This was interpolated between two high waters. The upper one was taken just above Rio Grande City from driftwood and marks on trees anyone gave him—that, he found that himself. The lower one was taken at what is known as Woods Landing, about three miles below.

Q. It wasn't the actual high-water mark, then, at this particular point?

A. I presume it was very close to it.

633 Q. You say it was interpolated; what do you mean by that?

A. Well, I mean we took the two high-water marks that we had, scaled the distance on the map in between them, and took the fall between the two and divided it by that distance and so got the relative amount of fall there would be above and below this point so that the river would have the same slope between the two.

Q. How far were these two points apart?

A. Six or seven miles.

Q. Make any allowance for absorption?

A. No, sir; not in as large quantities of water as run there, absorption wouldn't cut a particle of difference; 50,000 feet a second, I don't think absorption would cut any figure.

Q. 50,000 running?

A. Approximately that; 40,000 at high-water mark.

Mr. HAWKINS. I think it is shown that it is clearly incompetent evidence.

WITNESS. While it is like information gathered by engineers from their subordinates and checked over.

Mr. HAWKINS. If it is like all your other information we will let it go.

Judge BURCH. If there is no objection, it may be admitted, I suppose.

Direct examination continued:

Questioned by Judge BURCH. Q. Now, did you make a cross section at any other point, and have you made a tabulation from that?

A. Will you let me say that these cross sections that were taken by my leveller were taken five or six every mile—taken wherever the man who was taking the topography of the river had a transit point—set up a stake and whenever the leveller came to this point he would take the cross section of the river, and these would average about four or
634 five to the mile, sometimes maybe four and sometimes six in the mile. And wherever there was one of these stakes, why there

the leveller took his cross section, and I picked out of them—the whole lot of cross sections—two, one where the river was in a dry reach where the fall of the water at the time that the survey was made was uniform above and below; and so I got this cross section at Rio Grande City—picked out the particular one that seemed most favorably located for uniform flow through the cross section. I also picked out another place down near the other end, where my work stopped and the Mexican portion commenced, and that point was also in a straight reach of the river with uniform banks and clear cross section, and was about twenty-one miles by the river above Rio Grande City—

Q. About Brownsville?

A. Above Brownsville. I beg you pardon. And there would be then about 155 miles of river between the two cross sections.

Q. Now, you say you did actually take cross sections all the way down?

A. Oh, yes; taken on an average of four or five to the mile of these cross sections. I would make up from the notes I have four or five of them to the mile right along for the 160 miles or so that I surveyed.

Q. Was this along the course of an official survey of the river by the Boundary-line Commission?

A. Yes, sir; it was a joint survey.

Q. And these men were all under your orders and directions and turning over their reports to you nightly, and you had occasion to actually observe them?

A. Oh, yes; I had absolute charge of it; I was on the ground all the time.

Q. Were they skilled men in this respect?

A. This leveller that I speak of, Mr. Steele, is by far the finest leveller that I knew in my life. He has worked at levelling for, I guess, twenty-five years. He ran the levels on the location of the
635 of the Atlantic & Pacific west from Albuquerque when that was built.

Q. Now, then, you may take up the one above Rio Grande City, or above Brownsville, twenty-one miles?

A. Which one?

Q. The one above Brownsville. You have already testified about the one below Rio Grande City?

A. Yes, sir.

Q. Have you marked that one below Rio Grande City?

A. No; I don't think so.

(Exhibit entitled "Estimated flow of Rio Grande one mile below Rio Grande City, Texas. Conditions assumed. River at low water; sudden rise comes, rising 1 foot in 4 hours at first, and going on up to high water," marked with initials of witness "W. W. F., No. 5.")

Q. State what the facts were in regard to the next one.

A. The facts were about the same—you mean as to depth, etc.?

Q. Yes.

A. Well, I have on this sheet the cross section of that made on the same scale as the other, made up in the same way. Each one of the fine horizontal meaning on the vertical scale one-tenth of a foot, while each one of the vertical lines—fine lines—means on the horizontal scale—

Q. I think it would be sufficient to say it is put in the same form.

A. Yes, sir; made up in the same form; and the range of high water at that point was $12\frac{1}{16}$ feet range between low and high water—fourteen feet less than the point above.

Q. In other words, made to spread out more, something of that kind?

A. Partly that, and partly increase velocity of current and loss of water by leaving the channel of the river and never getting back into it again.

Q. At any rate, it was a fact that high-water mark was lower by several feet?

A. Yes; quite a number of them.

636 Mr. HAWKINS. Did you mean to say increased velocity; there was a little increased velocity at the same height?

A. The actual velocity at high water was not as great as the point above, but at twelve feet above low water it was.

Judge BURCH. Now I will offer that one also in evidence.

(Exhibit referred to, entitled "Estimated flow of Rio Grande 21 miles (by river) above Brownsville, Texas, &c.;" marked with initials of witness "W. W. F., No. 6.")

Q. You may state, in a general way, to the court what these tables of measurements show.

A. The first column shows just the mark—that is all that is; first low water, and then on to a rise of two feet and so on, up to high water. The next column shows the number of square feet of cross section that there would be of water flowing by that point for that height of water. For instance, for low water there was 1,226 square feet; now that is the number of square feet that there is embraced between this line and the bottom of the river. At one foot above, it would be the number of square feet embraced between the point one foot above this mark and the bottom of the river, and so on up—square feet of area. The next column means the fall; the fall expressed in the form of a proportion—that is, under the first head is 1 foot to 7,000. That is, the river would fall 1 foot in a ratio of 7,000. At the time the assumption is that the river is just beginning to rise from low water. Then the next column shows the current, computed by Kutter's formula; shows the current in feet per second. Now the next column shows the number of cubic feet per second that would that cross section, and is the product of the square feet of section into the current, multiplied—that is, 1,226 by 1.63—and it will give you 1,998. Now the next column shows the condition which I made to this computations; after you get by a one-foot rise, you have got to take into account the scour of the cross section. There is very frequently in streams of this sort a scour, an enlargement of the channel, due to the
637 increased velocity of current, so that there would be a larger cross section.

Q. On a rise of the river?

A. On a rising current; and in this column I have added what seemed to be a proper percentage for that, giving me in the next column the maximum flow in second-feet for each foot rise; and then in the last column I have figured the water that would be needed in addition to what the river would be presumably carrying at low water to produce this rise, which is in every case the quantity in the next to the last column, less 1,665 second-feet.

Q. Now what does the 1,665 mean?

A. 1,665 period. That is the second-feet that the river would probably be carrying at the low water, which I assumed here based on the slope that I found.

Q. The contour of the stream at that particular point?

A. Yes, sir; yes, sir.

Q. Then take an instance; just give an instance. Take a rise of three feet past that point.

A. Three feet would show that an additional amount of 4,186 cubic feet per second was needed, in addition what the river was carrying at low water, to raise it three feet. I have also added down here at the bottom the flow on the day my survey was made, based on the actual slope that they found.

Judge BURCH. Now, I will offer those two cross sections. Mark the map No. 5 A so that it shows that it is connected with the table.

That is all.

Cross-examination, W. W. FOLLETT:

Questioned by MR. HAWKINS. In making these last tables and charts that you have filed, of cross sections of the river below Rio Grande, what did you assume the amount of water in the river under ordinary conditions to be?

Judge BURCH: Low-water mark, wasn't it?

A. It was not an assumption exactly; it was a computation of what they would be at low water, the river on a stand, as it was practically when I made my survey. I think it was not at low water. It was above. It was two feet and one-tenth above the amount I assumed was low water in the computation, using the same slope, the same fall of the river, that there was at the time I made the survey, which I considered a fair assumption, because the river was practically stationary. It was falling a quarter of an inch a day or something like that. When I made the survey, the flow figured 1,655 second-feet.

Q. What number of cubic feet was that per second?

A. 1,665 cubic feet per second.

Q. What depth of water at that point?

A. Would be at low water, or at the time I made my survey?

Q. Would have been.

A. It would have been five feet approximately. Five feet and 2-10's perhaps at low water.

Q. Now then, what year was it when the measurement was taken?

A. It was December of 1897.

Q. It was in December of '97?

A. Practically two years ago.

Q. How high would the flood of 1897, the amount of water as measured at El Paso in that flood, have raised the Rio Grande at that cross section just mentioned?

A. Can't tell, because I don't know how much the flood would have been spread out. Perhaps I don't understand your question. Now here, there was 16,000 second-feet passed El Paso—cubic feet per second—16,000 second-feet passed El Paso one day during that high flood. Now do you want to know how much 16,000 second-feet would raise the river at Rio Grande City?

Q. Yes, sir.

639 A. It would raise it 8 feet practically above low water.

Q. How high would 8,000 cubic feet of water per second at Ringgold City have raised the water at that cross section?

A. Five feet.

Q. How high would 1,000 cubic feet?

A. Well, 1,000 would raise it less than one foot—in addition to what was flowing at low water.

Q. Well, just how much?

A. It would have raised it about 8-10's of a foot. This table is only carried out to single feet.

Q. How high?

A. Understand, that is in addition to the 1,655 which I figured was already running at low water.

Q. How high would 500 cubic feet of water at Rio Grande City have raised that river according to that measurement?

A. In addition to what was flowing?

Q. Yes, sir.

A. Well, it would have just started it to raising. My computation is that it would take 343 second-feet to start a raise—that is, the current has to be quick enough through the cross section before the raise begins.

Q. Is that the cross section above Rio Grande?

A. Just below Rio Grande City; about a mile below Rio Grande City.

Q. Above the head of navigation or just below it, or at it?

A. Below the head of navigation.

Q. How far below?

A. It is a mile below Rio Grande City. Now, I didn't see anything when I came down the river to prevent a steamer from going up to Roma; there wasn't any obstruction that prevented her going above.

Q. How far is Roma above Rio Grande City?

A. Twelve miles, scaled on the Emory map, along the axis of the river, and fourteen miles by river.

640 Q. These cross sections show, you stated, the height of the water in these places represented by the cross sections in the flood of 1897?

A. Yes, sir; those are the high-water marks. We got the previous flood.

Q. You mean the floods which occurred at this particular place in 1897, without any reference to where the floods might have come from?

A. I just mean the high-water marks that we saw on the trees.

Q. You don't mean to say that that was caused by the flood in El Paso?

A. In fact it occurred in September or October, the high flood down there in that year, and the river at flood was carrying 43,000 second-feet in the channel, perhaps, besides 5,000 second-feet which was passing down from the overflowed ground on each side.

Q. Explain what you mean by second-feet.

A. A cubic foot per second would be a stream one foot deep and one foot wide, flowing with the rapidity of one foot per second; that would carry one cubic foot per second. An acre-foot is the amount of

water necessary to cover an acre one foot deep. There are 43,560 square feet in an acre, and therefore to cover it one foot deep would require 43,560 cubic feet. Now, it happens that there is a very simple relation between second-feet and acre-feet—approximate relation within less than one per cent. One second-foot flowing for twenty-four hours makes practically two acre-feet.

Judge BURN. I wanted to get that on the record so that anybody could understand those terms.

Q. You have submitted a table of measurements taken from maps in taking the distances from the head of the Rio Grande to its mouth. By that calculation what is the distance from its head waters to El Paso, Texas?

A. I have not added the quantities up.

Q. Will you please do it?

641 A. 575 miles I make it. That, understand, is measured along the axis of the river only—don't take into account the quantities of the bends of the river's channels.

Q. What per cent do you think it would be proper to allow for the bends of the Rio Grande in addition to that distance?

A. Well, now, through some portions of its length there wouldn't be any per cent to add. Other places of its length there would be one hundred per cent to add, and it will range around or between those. Oh, I wouldn't attempt to give any general answer to that. Can't do it. Now, between Rio Grande City and Brownsville, where the river is very crooked, it would do to add one hundred per cent, and below Brownsville, where it was still crookeder, you ought to add nearly two hundred per cent; but I can't say what it would be up here.

Q. Could it be as much as 800 miles?

A. From the head waters to El Paso, along the sinuosities of the river? That would be adding about forty per cent. That might be. Yes; it might be. I wouldn't say that it was—it might be.

Q. Might be fully that much?

A. I would hardly say so. Of course that is just a matter of opinion. I would hardly say so.

Q. Now, how far, according to your scaling of the maps, is it from El Paso to the mouth of the Concho River?

A. 205 miles.

Q. What per cent should be added in that distance for sinuosities of the river?

A. Well, I can't say, Mr. Hawkins, because I have never been on any of that, except a short distance, say 25 miles. I have been down to the lower end of the point of San Sevan, and that was as far down as I have seen the river, and I wouldn't attempt to say what per cent.

Q. It is very crooked down that far, isn't it?

A. Yes; it is pretty crooked.

642 Q. Frequently almost double on itself in a detour of a mile or two?

A. I know of one or two places where there are bends of that sort.

Q. Now, how far, according to your scale of distances, was it from the mouth of the Concho to the mouth of the Pecos?

A. 250 miles.

Q. You have no personal information with reference to that?

A. No, sir; just from the map. Never seen any of it.

Q. Never seen any part of the Rio Grande from the Pecos up to within twenty-five miles of El Paso?

A. No, sir; never seen it.

Q. According to your calculation, Mr. Follet, how far is it from El Paso to Rio Grande City?

A. 772 miles.

Q. How far to Brownsville? I mean from El Paso.

A. You mean along the axis of the river?

Q. According to your table of measurements.

A. Well, from Rio Grande City to Brownsville I surveyed it, and I can give you the sinuosities.

Q. What are the sinuosities?

A. Well, I have practically got the sinuosities from Laredo. Perhaps we had better get on the axis to Laredo and start on the sinuosities from there.

Q. All right; give us the axis to Laredo and the sinuosities below down to Brownsville.

A. From El Paso to Laredo the map scaled along the axis of the river 665 miles.

Q. Now give us the axis independently below and then give us the sinuosities from El Paso.

A. Now, from Laredo to Brownsville it is, along the axis of the river, 202 miles from Laredo to Brownsville, and to the Gulf it is one hundred—

643 Q. No; I don't care anything about that. Now, by the sinuosities of the river from Laredo?

A. From Laredo to Brownsville?

Q. Laredo to Rio Grande and then to Brownsville.

A. From Laredo to Rio Grande City it is 142 miles by the sinuosities of the river, and from Laredo to Brownsville it is 319 miles by the sinuosities of the river, it being 177 miles from Rio Grande City to Brownsville by the sinuosities. That I know actually because I measured it.

Q. What experience have you had in your profession in measurements along the Rio Grande previous to the measurements which you have taken—which you took on your general reconnaissance in 1897?

A. Well, I stated I made estimates. I didn't say I made measurements. I estimated the flow of the ditches to be a certain amount.

Q. I am not referring to that. Had you had any previous experience in water measurements or surveys on the Rio Grande before 1897?

A. I made a survey in 1899 for the International Reservoir at El Paso. That was my first experience on the Rio Grande.

Q. Had you ever made any measurements in the northern part of the territory on the Rio Grande or its tributaries?

A. I had made a few on some of its tributaries.

Q. In what years?

A. Well, in 1890, 1892, and 1893.

Q. For what purposes were those measurements made?

A. Just some of them were for my personal gratification, and some of

them were obtaining the flow of some of the streams that I was making surveys of reservoir sites on, and some of them were matters of information that I was taking up when I was working in the Geological Survey.

Q. Did you make any surveys for reservoir sites in the bed of the Rio Grande itself for the Geological Bureau?

A. I made no surveys. I did reconnaissance work all along the Rio Grande, and examined and reported on certain reservoir sites; 644 that is, reconnaissance examination. There were no surveys in connection with them.

Q. Were these the reservoir sites that were segregated from the public domain by the General Land Office, and which are on the map—on the public maps of the Territory?

A. I presume so; they seem to occupy about the location.

Q. That work was done in what years?

A. That was done in the winter of 1889 and '90.

Q. Then your particular avocation at the present time is a surveyor?

A. I don't consider myself a surveyor. I am a civil engineer. My official position is that of a member of the International Boundary Commission between the United States and Mexico; my title is that of United States consulting engineer.

Q. When were you assigned to that position?

A. I was confirmed by the Senate of the United States on the first day of March, 1897.

Q. You have occupied that position since?

A. Yes, sir; up to the present time.

Q. Where did you establish your headquarters after you were appointed to this position?

A. El Paso.

Q. Did you go there before you were confirmed, or subsequently?

A. I had been there before I was confirmed, but I was in Denver at the time I was confirmed and came down; left Denver a couple of days or three days after that and came right through to El Paso.

Q. What was the first work to which you were assigned after you reached El Paso?

A. The first work that came before the commission was the erection of monuments on the island, on the old channel of the river at the island of San Lazario, below El Paso.

Q. But what work were you particularly assigned to after reaching El Paso?

645 A. I have answered you. The first work that came before the commission, as a member of the commission, I did that work. I wasn't assigned to any work.

Q. Were you assigned at any time to, or directed at any time by that commission, or by other authority, to examine—to commence the study of the data necessary for the construction of an international dam at El Paso?

A. Why, I think I understand, Mr. Hawkins, what you are getting at, and that work to which you refer was done before I was consulting engineer for the commission, when I was employed as an assistant engineer on the commission. Is that what you wish?

Q. Yes, sir.

A. On the first of August, 1897, I was employed as an assistant to the commission, and was then assigned to the duty of a study of the use of the water for irrigation in the drainage of the Rio Grande—

Mr. CHILDERS. You say 1897?

A. 1896, I should have said—1896.

Q. Were you assigned to any duties with reference to a study of a particular dam at any given place by that commission?

A. No; not at that time.

Q. Were you subsequently?

A. No; not subsequently.

Q. Did you not, under the direction of that commission, make a survey of a reservoir site just above El Paso—of two reservoir sites above El Paso—and make a report to the commission with reference to the same?

A. No, sir. In 1889 I was employed about the 4th or 5th day of July by the United States Geological Survey—by the Director of the United States Geological Survey—and was sent to El Paso to make a survey and estimate of cost of a dam for a reservoir above El Paso, and I made that during the months of July, August, and September, 1889.

Q. Who were you directed to report to in making that report?

646 A. There was a little misunderstanding about that. I was employed by Col. E. S. Nettleton, who was what was known as supervising engineer for the Geological Survey, and sent down there by him, and asked me to report weekly, and I did so, on the work. But, just about the time that the work was completed I found that Gen. Anson Mills, who was then major of the 10th Cavalry, and who had been there about the matter, was there before I came, and had been assisting me in one way and another. I found that he had letters from the Secretary of War and from the Director of the Geological Survey, which apparently placed him in charge of the work, and so, to obviate all ill-feeling, when I made my report I addressed it to Col. Mills, as he was then promoted, so that I was apparently reported for two people.

Q. Were you directed by any authority to report to Col. Mills?

A. No; I wasn't. I really was not, but when he showed me those letters I saw how it came up. I had already made out my report, addressing it to Col. Nettleton, and he felt aggrieved in the matter, and got those letters and showed them to me; and I knew that Col. Nettleton wouldn't care anything about it, and he seemed to care a great deal, so I addressed—I says, al'right, I will address my report to you, and I did so, and he transmitted it to Col. Nettleton, and he transmitted it to Major Powell.

Q. That was in 1889?

A. Yes, sir; in 1889.

Q. That was just about the time the Senate Committee on Irrigation came to El Paso?

A. They came through when I had my map about half done, but it was intelligible when they were in El Paso, and they held their meeting in the old fire hall.

Q. You appeared as a witness, I believe, before them?

A. Yes; I think I did. I think Senator Stewart asked me a few questions, just to verify the map. Some of the questions related to the survey at that time. I hadn't written my report at that time.

647 Q. How long did you continue there under the direction of the Geological Department?

A. In El Paso?

Q. In El Paso, reporting to that department, and also to Gen. Mills.

A. Why, I think I left on the 19th or the 20th day of September, 1889.

Q. When did you return there?

A. My next return there was, I think—the next time I was in El Paso was in February, 1891—in February, 1891.

Q. In what capacity were you there then?

A. I was then assistant engineer on the artesian and underflow investigation that was being made by the United States Department of Geological Survey; reported to Col. Nettleton, who was chief engineer on that same investigation.

Q. Was that the same time you were over in the Pecos Valley?

A. Yes, sir; same time we were over at Eddy.

Q. When did you next go to El Paso on engineering work?

A. In the fall—in December, 1895.

Q. What was the work on hand then?

A. I was employed as an assistant to the then consulting engineer of the boundary commission, a man named Dabney, and we made a map of that Sheridan case. Made surveys of the El Paso Valley and map there, and then went down and made surveys and map of the island of San Lazario next.

Q. Then your real connection with the boundary commission commenced in 1895?

A. Yes. There was three months after that that I was not with the commission. During the summer of 1896, May, June, and July I was not with the commission.

Q. How did you come to make the reconnaissance and report which you have testified to, which was made by you in 1896?

A. I was instructed to do so by Capt. George C. McDerby, of the Corps of Engineers of the United States Army, who had been detailed to act as engineer member of the boundary commission on the report on question relating to the international dam.

648 Q. While you were connected with the boundary commission where did it have its headquarters?

A. Where did you mean?

Q. In El Paso.

A. In the county court-house. We have always had our headquarters there.

Q. You had remained there with that commission, did you?

A. When?

Q. Since your connection with it?

A. Well, I have no office there. The commission has the large old court room which was used as a Federal court room. I haven't a personal office.

Q. But the commission had a regular headquarters, with offices for its various officers, and you kept your office at the place provided by the commission for you?

A. Yes, sir.

Q. You were familiar with the acts and doings of the commission in its sessions from time to time, were you not?

A. No, sir.

Q. You were not?

A. No, sir; under the rules that were adopted by the commissioners when they held their first meeting years ago the consulting engineers were left out.

Q. What do you mean by that?

A. They were not invited to be present at the meetings of the commission.

Q. They were not counted as members of the commission?

A. That is about what it amounted to. Their rules provide that no business should be done unless both commissioners—I guess that is the treaty—unless both the commissioners were present; and then they met and resolved that the commissioners and their secretaries should be present at the meetings of the commission, and the consulting engineers should appear and furnish maps and data when asked to do so; and
649 under that ruling I never intruded myself on the meetings of the commissioners.

Q. Who appointed the engineers of the boundary commission?

A. Well, there is only one.

Q. Who appointed the consulting engineer?

A. The President of the United States.

Q. Did the commission designate the engineer?

A. The commission; no.

Q. Did the commission suggest the engineer?

A. The commissioner suggested my name, not the commission—the commissioner.

Q. And the Mexican commissioner agreed to it?

A. He didn't have anything to do about it. The appointments are made entirely independent. They appoint whatever members they wish and our Government appoints whatever members it wishes.

Q. Were you familiar with the proceedings of the meetings of the boundary commission just previous to the time when you started out to make these reconnaissances?

A. No, sir.

Q. Did you know that you were required to make this until you received an order from Capt. McDerby to make it?

A. I had a general idea that that was what I was going to be detailed to do. They employed me early in July, but I was engaged in some other work, but they waited until the first of August before going down there; and then I was in El Paso a couple of weeks before Capt. Dabney got there, and he and the Mexican engineer hadn't arrived; after they arrived they formulated their work.

Judge BURCH. Is this is to the proposition of testing the witness' recollection?

Mr. HAWKINS. This is as to how this witness came to make his examination, and what the object of making the examination was.

Q. What were the orders which you referred to, upon which you made this investigation?

A. The letter which Capt. McDerby wrote me. Have you got
650 a copy of the report? The letter is printed in that report.

Q. Then you have got a copy of the order?

A. It is on page 47 of the report.

Q. I notice in the letter of Capt. Geo. MacDerby says that "the commission have decided to adopt the plan of operations outlined by Colonel Mills in his memorandum to Mr. Osorno. The questions referred to me for report are, therefore, those mentioned in the second paragraph of that memorandum." Did that memorandum accompany his orders to you?

A. No. You will see right in the next paragraph, right after Captain Derby's signature, on the next page: "No copy of the memorandum referred to in the first paragraph of the above letter was furnished me, although I have seen the paper."

Q. You had seen that memorandum, and then knew what was the memorandum referred to? Did it refer in any way to the construction of an international dam at El Paso?

A. My recollection is very indistinct as to that memorandum. I can't tell you as to that memorandum. I think it did refer to certain investigation in connection with the case of Mr. Ibarrola, and my soundings for bed rock at the crossing of the Southern Pacific above El Paso, so it is quite evident that it did. But I can't state as a matter of personal memory that it did. It is a matter of such doubt.

Q. As a matter of fact, the principal object of your trip was to gather this data for the purpose of determining whether it would be feasible to construct an international dam at El Paso which would have a sufficient supply of water, was it not, Mr. Follett?

Judge BURCH. If this is for the purpose of showing the interest of the witness, as a witness, in this case I have no objection; if it is for the purpose of testing the bona fides of the United States in prosecuting this suit, I object.

The COURT. What is the object?

Mr. HAWKINS. To show the particular zeal which the witness may have had, or bias which may have been in his mind when the determination of the facts which have been present here as having been determined by him were collected; to show his interest, that is all.

The WITNESS. May I make a statement? The statement I wish to make is that I very zealously carried out these instructions, as I always do any engineering matter that is referred to me for report. I have my professional pride in it, and I done the very best I knew how. I read what that information is: "The work you outlined in this letter was for the purpose of gathering data to enable you to answer two questions raised by Mr. Richard Olney, Secretary of State, and Señor M. Romero, Mexican minister at Washington, in convention signed by them on May 6, 1896. These two questions are suggested in the following paragraphs of the above convention:

"First. The amount of water of the Rio Grande taken by the irrigation canals constructed in the United States of America.

"Second. The average amount of water in said river, year by year, before the construction of said irrigation canals, and since said construction, the present year included."

That was the purpose of Captain Derby's instructions to me, and it

was to gather data to answer these two questions that I made that trip, and also that I did the very best I knew how.

Q. Now, as I understand you, then, it was an absolutely impartial disposition on your part to gather data with reference to the general subject of the amount of water flowing over the watersheds of the Rio Grande and what was done with it?

A. Yes, sir. And I also had along with me—the Mexican Government sent an engineer along with me, and to accompany me and see that it was gathered impartially; that is, during the most of my trip. There was a second one afterwards—the first man had to go back—but during the major part of the trip there was a Mexican engineer with me.

Q. If that is true, why did you, when you reported to your commission or to your commanding officer, add the following clause: "There is not a sufficient water supply in sight to serve both the Elephant Buttes and El Paso reservoirs, and one scheme must give way to the
652 other. If the United States Government can find any way to control the storage of water at Elephant Buttes, such control should be exercised. If that dam is built at all, its use of water should be conditional on its stopping no flow when the supply of water at El Paso is short?"

A. That was one of the conclusions I reached in my investigation. If you will look at the bottom of page 105 you will find this sentence: "In accordance with your letter of instructions, in which you request from me any suggestions that may occur to me bearing on the problem under consideration, I add the following discussion of the probable water supply for the El Paso reservoir." There were other clauses in that agreement that was signed by Mr. Romero and Secretary Olney—there were other clauses that did refer to an international reservoir at El Paso. Brigadier-General Mills was the first promoter of the international-dam project at El Paso. He suggested it first in 1886 or 1887, I think.

Q. The result of your conclusions, as stated in that report, were that there was a sufficient supply of water for international-dam project, provided reservoirs were not built up the river, was it not?

A. I believe that is what you have read.

Q. Yes, sir. The particular reservoirs referred to being the Elephant Buttes reservoirs?

A. Yes, sir.

Q. You mentioned in that report various other reservoirs in Colorado and in New Mexico that might possibly be built in the future, did you not?

A. I believe so; yes, sir.

Q. You made a recommendations with reference to any of these other reservoirs not being constructed, or being prevented from being constructed, in that report?

A. No; not that I recollect of.

Q. You mentioned various others, some large ones and some small ones?

A. All of them were; the greatest capacity of all of them was
653 about half the capacity of the Elephant Butte, and several of them were on streams where they would store water that would not in any likelihood ever reach the Rio Grande—upon streams which become dry before they reach the Rio Grande.

Q. And others that you refer to in that report as not very likely to be built?

A. I referred to quite a number that had been projected in former years, and were not likely to be built.

Q. Has the Elephant Butte reservoir ever been built?

A. No, sir.

Q. Has there been a sufficient supply of water for the international dam since that report was made?

A. Yes, sir; during 1897 and 1898 there were three or four—twice as much, or something like that—enough to have filled it twice. This year there has not been enough to supply anything.

Q. Those were large and extraordinary floods?

A. Yes; for those two years.

Q. They were the heaviest El Paso has ever known?

A. I think there was one other year when the flood has surprised them.

Q. When?

A. I am not sure about that; I think it was in 1891; 1,600,000 acre-feet during the summer of 1891; six months, from April to September. The flow of 1897, though, was the largest.

Q. That came on in a rush, did it not?

A. It lasted some time.

Q. How long did it last—about how long?

A. It lasted from about the first of May until about the 15th of June; about six weeks.

Q. What was the date of the maximum flood?

A. The 27th day of May.

Q. Within five days after the 27th day of May, what per cent of that flood passed El Paso?

A. I should say, without figuring it out, about forty or fifty per cent.

654 Q. Forty or fifty per cent of that water passed in ten days?

A. Yes, sir.

Q. And that was the largest flood ever known in El Paso, wasn't it?

A. No; there was one other in 1891 that went up to about the same height.

Q. You mean that the 1891 flood was as high as 1897?

A. The channel was better, the river was in better condition, and so it didn't reach a greater height. I think that the volume of the water passing on the height of the flood reached the 1897 flood.

Q. But it had never been as high at any time as it was in El Paso in 1897?

A. In 1898, in July, it was about an inch higher at the Stanton street bridge than it was in 1897.

Q. But it didn't cover one-half of the territory?

A. No; because they built a levee and confined the water to the river, and it didn't get a chance to flow out over the town.

Q. How wide was that flood, as it flooded below the town in 1897?

A. I can't tell you.

Q. It reached from the court-house to Mexico, didn't it?

A. I guess it did; well, practically the court-house, just across the street.

Q. That is a mile or more?

A. Oh, yes; more than a mile. It is between one and two miles.

Q. And it overflowed a considerable portion of Mexico, did it not?

A. Not as large an area near in Mexico; that is, you mean of the town of Juarez, not as large an area as it did El Paso.

Q. How many times would that have filled the international reservoir?

A. About twice.

Q. Could it have been filled by the flow since that time?

A. Yes, sir. Summer flow of 1898 would have filled it.

A. It would?

A. Yes, sir.

Q. Was the summer flow of 1898 an unusual flow at El Paso?

655 A. Well, I don't think you could hardly call it an unusual flow. It was perhaps a little better than usual, but the flow at El Paso varies within such wide limits that it is impossible to strike a mean and say one flood is above mean or below.

Judge BURCH. Are you talking about the International or Elephant Butte?

The COURT. I am free to say that I don't see its competency, but probably counsel will make it so.

Q. You think, then, the flood of 1898 was not an unusual flood at El Paso?

A. Well, there was 598,000 acre-feet passed there during the season, and, with the exception of 1891 and 1897, that is the highest flow we have any record of. In 1890 there was 860,000—hold on a minute. I made a mistake. That flood in 1898 was 600,000, practically, second-feet.

Judge BURCH. Second or acre feet?

A. Acre-feet; 600,000 acre-feet. In 1890 we had 860,000, and in 1891, as I have said before, 1,600,000; in 1892, 850,000. So that it would be pretty fair to estimate, I guess, that the summer flow in 1898 was about a mean.

Q. About a usual flow?

A. You can't say usual flow. I mean there wasn't anything usual about the river at El Paso.

Q. From the data which you gather on these reconnaissances and the other information that you have in there (referring to Senate Document 229), you finally concluded and reported that it would take, at an average flow, or the usual flow, or rather the flow which was probable from the watershed of the Rio Grande—

A. Well, say the flow that was probable to come, from the records we had.

Q. —two years to fill that reservoir, did you not?

656 A. I don't recollect making any such deduction as that. I would be free to acknowledge if you will point it out.

Q. You have no recollection?

A. I have no recollection of making any such statement.

Q. My recollection is that you did. I may be mistaken.

A. It is all there.

Q. Didn't you state before the irrigation commission that your esti-

mates showed that it would take two years to fill the international reservoir.

A. Oh, well, we had no records that amounted to anything at that time. You see that was the first year that the gauging station had been established there, and the river was new to me. Whatever I said at that time was a mere guess, probably. It seems to me that there was some statement that it was probable that the first filling would take two years owing to great seepage and evaporation, which would, of course, be the same in future. That was merely a guess, as I had no records to base an estimate on at that time. That was in 1889.

Q. Now, Mr. Follett, with reference to the character of a flood of the Rio Grande at El Paso, what is its character? Describe from year to year as you have seen it, in a general kind of way.

A. Well, it is what you could probably call spasmodic—that is, in some years, and most of the years, there is a flood. The river will run, starting in the winter—run a small quantity of water from 200, perhaps up to 500 or possibly a 1,000, second-feet, along through the winter. Then along in April or May it is likely to rise, and it is likely to be pretty high during the latter part of May. Then is when we always get our highest water—almost always. And then in June, sometimes, it will begin to decrease, and then some years it will go dry. Does go dry early in July. And then some years—last year, in 1898—we had the maximum flood of the season in July. There was a flood came down in July.

Q. Then in August and September it may be dry all the time?

A. Yes; and it may have spasmodic rises that probably come from local rises along some of its lower tributaries. Very muddy water will come down in the river. In the north the river will jump up and come down again, and then along in November or December, why it will settle down to its winter flow again. But these conditions are subject to very wide ranges.

Q. Well, now, while it is flowing isn't it a fact that at times without any apparent reason it ceases to flow?

A. Well, it goes dry. It goes dry, and my reason is that there is no water comes down.

Q. It might be flowing along to-day through your measuring gate and to-morrow it might subside, and three or four days, or a week or two weeks afterwards, might commence and run again for two or three days, might it not?

A. Why, yes; it might be flowing 10 second-feet to-day—very little water—and to-morrow stop. Of course there is always that point every time the river goes dry. The next day it is flowing, and the next day it is not. It is an absolute necessity for it to go dry.

Q. Isn't it a fact that sometimes the flow in the river continues from one to two or three days?

A. I have no recollection of any such flow as that. Generally, as far as I know, it always lasts longer than that. In the shortest flow that I have any record of, and that I have any recollection of, came this last spring. While the river wasn't absolutely dry, but it was practically that. Run ten second-feet—just a little bit of a stream—through the gauge station, and on the 24th of April it rose 600, and then up to

730 second-feet, and 730 was the maximum, and then it fell a little and on the first and second of May it rose again—just a little. It didn't go down to the ten second-feet flow until the 23rd of May. That was practically a month, and that is the shortest flood that I have any knowledge of during the spring. Now, during the summer, along in July and

August, when these sudden spurts come down the river, why it
658 may not run quite as long as that. Now in July of this year we have a quantity of water twice there. This year in July it

started. On the 18th day of July it was not running, on the 19th there was 60 second-feet, and then it run up to 1,900 on the 22nd and 23rd, and then it fell again, until the 8th of August it was not flowing again. This is from the 18th of July to the 8th of August, about twenty days.

Q. Have instances occurred when it would be at one height at a given time and then within two or three days be lower, and then two or three days again higher?

A. Oh, yes; it fluctuates, you know.

Q. Fluctuates from day to day, both up and down?

A. Most always does on the flood; very seldom rises. If you wish to go into that you can look into those profiles and they will graphically show it—these profiles that Mr. Harroun testified about. If you will look at one of those you will how it will go up and down. They show the fluctuations from day to day.

Q. You have testified about the character of the bed of this stream and of its banks from point to point along its route, and you have seen it, and that the flow of the Rio Grande is lost, that a very considerable portion or percentage of its waters would be lost by seepage, would it not?

Judge BURCH. We hav'n't gone into any expert testimony by this witness, and I strictly pledged myself to him not to have done so. We hav'n't asked him a question except as a matter of actual evidence, and I therefore feel obliged to object to the question. I simply asked him for actual facts within his observation and not any hypothetical questions based upon theories. I shall interpose that objection for the same reason that I did in Mr. Harroun's case.

The COURT. I don't understand that this witness has testified as to the quality of the bed of the river at various points for absorption of water; simply undertook to say that it is rocky and sandy at various points.

659 Mr. HAWKINS. He has testified about the loss of water by absorption.

Judge BURCH. I don't so understand his testimony.

Mr. CHILDERS. That expression was used once on cross-examination and not on the direct examination.

The COURT. If the witness has testified that this bed and banks were sandy at a certain place you may ask him how he knows it. I don't understand that the witness has undertaken to say that the soil at any particular place was capable of and was absorbing the water of the stream.

Judge FALL. Can't we ask him to explain the loss of water between Rio Grande City and Brownsville?

The WITNESS. These tables show a large loss of water—of the flood flow.

The COURT. The objection will be sustained.

(To which action of the court in sustaining the said objection the defendants by their counsel then and there excepted.)

Q. How do you account for that loss of water that you testified to between the upper and lower cross sections of the Rio Grande?

Judge BURCH. I object. It is making him their own witness for the purpose of their own case. I am simply holding to the line of strict cross-examination.

The COURT. I think this last question is competent.

Mr. CHILDERS. We don't want to be bound by this, as it is not any part of our case.

A. He wants to know how I explain the difference in the measurements that I computed here between the upper and lower cross sections. Now, at the upper cross section I found by my computation that the probable maximum flow in the channel of the river at high water was 43,000 second-feet, while at the lower one it was only 30,500 second-feet. That is explained by the fact that between those two points there are several places where there are large quantities of water leaving the flow of the river—that is, leaving the immediate neighborhood of the river and never coming back—go out and flow out through side channels. 660 There are, that I know of, that I personally examined, three such places. One of them, where it is a clear and tremendous channel, goes through three of this places. It flows in the Rio Colorado and into the Gulf without even coming back to the bed of the river. The one to the south, the Soleseno, flows to the south and goes over a lagoon away south of Matamoros, and reaching the Gulf in that way, and never comes back into the river. And another thing, another reason for that is as soon as the river registers a stage of three or four or five feet below high water, or two feet below, it begins to overflow its banks. At this particular point where I have taken this cross section it didn't, as I picked out a point that had high banks on both sides, but about three miles above that there is a large crevasse where the water runs out and down through lagoons and spreads over the the country for miles, and of course the flood coming down the river is decreased in that way. The flood might pass Rio Grande much quicker than it would pass Brownsville, and therefore the flow per day or per second at Rio Grande would be much larger than it would be down by Brownsville.

Q. There is another one that you have not stated?

A. Not that I know of that cuts any figure, but it don't cut anything, not the slightest figure with these maximum flows. It wouldn't be but like a cup full of water.

Mr. HAWKINS. I think the witness has qualified himself to be examined on that subject.

Mr. CHILDERS. I don't know how you can qualify a witness on cross-examination.

Judge BURCH. I shall object to the next question that calls for a hypothetical question and answer.

The COURT. I haven't heard any motion to strike out the latter part of this answer. The examination of the witness on the question of the absorption of water by the banks and bed of this stream is not competent if he was not examined on that subject.

Mr. HAWKINS. If there is any evidence from him on that subject which the Government has presented, then it is competent.

Q. I will ask you, in your report, which has been filed as evidence in this case, if you did not make calculations and submit facts with reference to the amount of absorption of the flow of the river?

Judge BURCH. Objection.

Mr. HAWKINS. This gentleman's report is in evidence.

The COURT. This report of his is bodily in evidence—

Judge BURCH. The report is offered for what it is worth, not a part of his examination, and it is not competent for the defendants in this case to reach that report other than by direct testimony from anybody whom they see fit to introduce. It is not a part of his cross-examination. I think the rule is perfectly plain. I object as not being cross-examination.

Mr. HAWKINS. The Government has filed that report as a part of its case. It is in evidence before this court, and we have the witness who made the report on the stand. We have a perfect right to cross-examine him with reference to that report and its accuracy and truth. If that was to the contrary, I think the Government wouldn't have much trouble in winning any of its cases.

Judge BURCH. If that report had been introduced in evidence in connection with the testimony it might be one thing, but it was not, and on the contrary it has been in evidence several years, upon the former hearing of this case before this court.

(Further discussion by counsel, pro and con.)

Mr. HAWKINS. We will leave this question, then, until further consideration of the matter.

The COURT. Proceed.

Mr. HAWKINS. We reserve the right to go back to this question, and with that, we are through with the witness at this time.

Judge BURCH. You have the right at any time during the progress of the case. We rest our case.

Mr. HAWKINS. We have no opening statement to make.

662 Judge BURCH. In good faith to counsel, Mr. Harroun would like to go home on account of his wife. He would come back on a telegram if he is needed.

Mr. HAWKINS. We have no objection. There is one thing I would like to ask him, and have him recalled as your witness in this matter. I think that is perfectly competent. I want to ask Mr. Harroun if there were any other water measurements, besides these testified about, that he took in the discharge of the same duty at regular stations between the points which he has testified to.

P. E. HARROUN recalled for further cross-examination:

Questions by Mr. HAWKINS. You have testified as to measurements of water taken by you and furnished by the Department to you during various years at Del Norte, Colorado; Embudo, New Mexico; San Marcial, New Mexico; Rio Grande, New Mexico; and El Paso, Texas. Was there any measuring stations under your charge at any time during the years referred to in these measurements between any of these points which have not been mentioned by you in your testimony?

A. Any gauging stations?

Q. Yes, sir.

A. No, there was no other gauging station maintained along the Rio Grande between those points during those times. These are the only points at which stations have been maintained on the river.

Q. Was there any station at Socorro?

A. No; not to my knowledge.

Q. Was there any measurements taken at Socorro?

A. There was a measurement made at Socorro.

Q. I mean any regular measuring station.

A. No; no regular measurement. It occurs to me that there was a measurement or a station maintained at Antonito, Colorado, during perhaps 1893 or 1894, but owing to the grading of the railroad track in there one winter, and other consideration, the measurements were of no value and it was discontinued. My recollection is that it was in 1893 or 1894.

Q. There is no other data of any particular point which has been gathered by you or under your charge, except that which you have testified?

A. There is no data from any gauging station, no.

Q. Was there any other gathered by you by any other means than gauging stations with reference to the flow between these points?

A. Yes; there was. That is, I have made at odd times—I have made certain measurements.

Q. Was there any regularity to such measurements?

A. None at all.

Mr. HAWKINS. Then we don't care for them.

Judge BURCH. You may go home with the understanding that you are to come back on the receipt of a telegram if counsel need you.

Judge BURCH. That is the case of the Government.

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DEFENDANTS' CASE.

ALLEN BLACKER, a witness introduced on behalf of the defendants, being duly sworn to testify the truth, the whole truth, and nothing but the truth, being examined by Mr. Hawkins, he said on direct examination.

Q. Please state your name, age, and residence.

A. Allen Blacker; residence, Otero County, New Mexico; age, sixty-seven years.

Q. How long have you lived in Otero County, New Mexico?

A. Since June 16th, 1898.

Q. Where did you live previous to that?

A. El Paso.

Q. For how long a time did you live at El Paso?

A. Twenty-eight years.

Q. What official position do you now hold?

A. Commissioner of Otero County.

Q. What official position have you held in El Paso, or in its vicinity?

A. Well, I have been county judge, district judge, member of council, member of the legislature.

Q. How long have you known the Rio Grande River?

A. Thirty years.

Q. Where did your knowledge of it first commence?

A. About the first of August, 1865, at Albuquerque.

Q. Now suppose you go ahead, Judge, and describe in your own way the general knowledge which you have of the Rio Grande, and how you obtained that knowledge; dating back from the time of that first
665 acquaintance up to the present time, telling its general character as to drought, floods, and any other facts which bear upon that character.

A. Well, in 1869 there was very little water in the river, as I remember. In 1870 and 1871 there was some water; however, not sufficient for irrigation in El Paso County. In 1872 there was not sufficient water in El Paso County for irrigation. In 1873, 1874, 1875, and 1876 there was a limited supply of water; '77 I don't think there was any water for irrigating at El Paso. In 1882 there was not water to irrigate at El Paso, and '86, '87, and '88 there was not a sufficient supply at El Paso, El Paso County. In 1889 I think was a dry year, and '90. There was a flood in 1891 and in 1897, and between 1891 and 1897 there was not in any of those years sufficient water at El Paso to irrigate—that is, for all who desired to irrigate.

Q. From what time to what time were you district judge of that district?

A. From 1875 to 1881.

Q. Where did your district—what counties did your district comprise?

A. El Paso, Presidio, Tom Green, and Crockett.

Q. How many of these were Rio Grande River counties?

A. El Paso, Presidio, and Crockett.

Q. During these years when you were district judge, or during any other years of which you have mentioned, did you travel between El Paso and any of the more easterly counties of that district, or any other part of Texas along any portion of the course of the Rio Grande? If so, what?

A. Yes; on the river, as far as Fort Quitmann.

Q. How far is that below El Paso?

A. 100 miles.

Q. During that time, or any part of that time, where did the public road run, that you traveled, with reference to the river bed?

A. Most of the way in sight of the Rio Grande.

Q. Did you ever travel in the bed of the river, any public road
665 there any of this time, during the years that you have mentioned?

A. Yes, sir.

Q. At what time did the public road lay in the bed of the river?

A. In 1875, '76, and, I think, in 1877.

Q. Did the road lay right down in the channel of the stream where the water would have flowed if there had been water in the river, or around it—to one side?

A. It was right in the river, but there was no water.

Q. There was no water?

A. No water.

Q. Was generally used as a public road?

A. Yes, sir.

Q. About how far—from what place to what place—did that condition extend?

A. From about five miles below El Paso to one or two miles of Ysleta, south of El Paso, and then north of El Paso from the smelter to the Duras Nita, about six or eight miles.

Q. Did you ever travel in the bed, in the dry bed of the Rio Grande, on public road north of El Paso?

A. Yes, sir.

Q. During that time?

A. Yes, sir.

Q. State, Judge, from the time you first knew the Rio Graude, thirty years ago up to the present time, with reference to the years or periods of years which have intervened—please state whether or not, according to your recollection, there is any material difference between the character of that river and the flow of its waters in the vicinity of El Paso from what it formerly was.

A. No, sir; I don't think there is any difference. Been about the same since about 1871 up to the present time.

Q. Sometimes there are floods, are there?

A. Yes, sir.

Q. And sometimes droughts?

A. Yes, sir.

Q. Do they occur in about the same general way that they did thirty years ago?

A. Yes, sir.

667 Q. Then you have been engaged in irrigation and the cultivation of the soil by means of artificially applied water?

A. Yes, sir.

Q. Where?

A. Well, at near Ysleta. At Florence Grove. I tried to cultivate about three or four miles this side of the smelter—five miles, perhaps six—but it was not a success; it was a failure.

Q. When was that?

A. That was in 1873, I think it was.

Q. What was the cause of the failure?

A. Well, the irrigating. The acequia that was built by authority from the city was not sufficient; the banks were not sufficient and it would not hold water.

Q. And was there a sufficient supply of water in the river at that time for that ditch?

A. The river was high; it was during the rainy, unusual period. Since that, however, there was not water to fill even a ditch.

Q. From what you have observed of the flow of the river, if a reservoir was established 125 miles above El Paso, which would impound the flood waters which come down the river, or even all the flow of the river, and was used for irrigating land in the valley of the river below the reservoir around Las Cruces, or above Las Cruces to the reservoir, would it have any effect upon the navigation of the river from a point as far down as Rio Grande City, within 200 miles of the mouth. Would the construction of the dam and use of the waters have any effect upon the navigation?

A. I think not.

Mr. HAWKINS. That is all.

Cross-examination by Judge BURCH:

Q. I suppose you have records of all this to reinforce your recollection?

668 A. Well, I have been a district judge down there, a great many cases coming up, and I have had the honor to be chairman of the acequias in the city council, and I have frequently testified on this point before.

Q. That wasn't the question I asked you. You are a lawyer?

A. I have no record.

Judge BURCH. No further cross-examination.

Redirect examination by Mr. HAWKINS:

As county judge had you any relation to the county commissioners of El Paso County?

A. Yes, sir.

Q. Do these county commissioners have in charge the management of public acequias and ditches?

A. Yes, sir; outside of the city.

Q. What relation did you have to that board?

A. I was chairman and had a vote when there was a tie.

Q. Has this water question been an issue there before these commissioners for years in the past?

A. Oh, yes.

Q. Has there been any trouble about supplies of water, coming before the commissioners to be adjusted?

A. Yes, sir.

Mr. HAWKINS. That is all.

Dr. ALEXANDER M. HADLEY, another witness on behalf of the defendants, having been duly sworn, upon oath testified as follows, being examined by Mr. Hawkins on direct examination:

Q. Please state your name, age, residence, and occupation.

669 A. My name is Alexander M. Hadley; I am physician in practice, and live at Rio Grande City, Starr County, Texas.

Q. Age?

A. 65 years old.

Q. How long have you lived at Rio Grande City, Texas?

A. I have lived there since 1880.

Q. Previous to the commencement of your residence there where did you live?

A. Comargo, Mexico.

Q. How far is it from Rio Grande City to Comargo, Mexico?

A. They call it six Mexican miles—two leagues.

Q. How long did you live at Comargo, Mexico?

A. From November, 1864, up to 1880.

Q. You have then lived in that immediate vicinity, on the Rio Grande, since 1864?

A. Yes, sir.

Q. Now, Doctor, will you please proceed in your own way to describe the general character of the Rio Grande, and of the country tributary to the Rio Grande, as to agriculture, rainfall, flow of water in the Rio

Grande and its tributaries, and any other facts which bear upon this investigation.

A. Well, the Rio Grande River when I first saw it was a considerable stream; that was in November, 1864, at Rio Grande City. They were using the stream then to export cotton to Matamoras. Many steamboats were in the business—maybe some twenty-three or -four. I remember several of them. And there was a little town built up in front of Rio Grande City by refugees from Texas, principally during the war, and there they had a large deposit of cotton, which the steamboats came up and took to Matamoras. In 1865 we had a tremendous overflow, the greatest overflow that was ever known on the Rio Grande, according to the experience of the oldest inhabitants, since '42; '42 was still larger than this one. It caused the destruction of old Reynosa, and they were

670 compelled to remove the old Reynosa to the new Reynosa, which is opposite Hidalgo, in Hidalgo County. This rise of '65 overspread an immense territory, from the tremendous rise that came from the San Juan and its tributaries, and happened to strike the Rio Grande when it was also on a tear, and the water of the two streams caused a tremendous overflow, which is still in the memory of the oldest inhabitants. It overflowed Comargo, and if it hadn't been for the steamboats there that afforded succor to them there would have been many people drowned. As it was, many of the inhabitants were compelled to move up to New Comargo. That is a new town about a mile from there, on the opposite side of the San Juan, situate on a hill. Now, this immense overflow of territory filled all the lagoons, estuaries, and irrigated the country for miles on both sides of the river, and was only held on bond by the foothills, and where there was an opening in these foothills it still went through and overflowed an immense territory. This watering of the soil and this filling up of all the arroyos and filling up of all of the lagoons and estuaries gave to that country a perennial flow of water, which lasted up to 1880.

In 1880 there was a notable—a great diminution; so much so that one small steamer done all the traffic on the Upper Rio Grande from Brownsville to Rio Grande City and Comargo, and they would occasionally have trouble in making the trip at that early day.

In 1882 I saw the river so low opposite San Miguel that the little boys would wade through up to their knees and plant down arrows to indicate the route they took, so as to be followed by their companions. I suppose it was probably a foot and a foot and a half deep. That is some twenty-one miles below Rio Grande City.

In 1886 and 1887 were two years notorious for the tremendous fall of water. There was a rainfall during those two years that was somewhat remarkable. I presume that forty inches of water fell.

MR. CHILDERS. What two years were these?

671 A. '86 and '87; but in '88, then a drought set in, which has followed up until this year—up to June of this year.

MR. CHILDERS. When did you say that began?

A. In 1888. In the year '90, '92, '95, and '94, the drought was so terrific that the inhabitants had to be assisted through charity and donations. Donations were made by the charitable people of the middle and eastern

and southern Texas to the inhabitants of Rio Grande City, to the inhabitants of Hidalgo, and I think also to the inhabitants of Zapata County, and if it hadn't been for these donations there is no doubt but what hundreds and probably thousands and thousands of people would have died of starvation. I have never seen them driven to such extremities. They would go to the carcasses that were drying in the sun, that had died of starvation, and eat them to satisfy their hunger. In that time I am satisfied that ninety per cent of the stock of those counties that I have named died, and people who were able, and who lived near to the railroad, transported their stock out of the country. Now, with regard to the navigability of the Rio Grande, there were years there when I am satisfied that the steamboats couldn't possibly have made more than one or two trips a year.

MR. CHILDERS. We object. We prefer to have the facts rather than his opinions.

MR. HOWKINS. What effect did these—in the first place, how far—over what section of the country did this drought extend?

A. That drought extended to Guadalupe and to Victoria counties, not to such a degree to Guadalupe as to the Nueces River. But, taking, for instance, a line of the Nueces River, it extended up to the New Mexican line, and in some counties it was worse than in others; but that drought has existed since 1888 in Hidalgo, in Starr and Zapata, and in Comargo, and in Encinal, and in Nuevo Leon—over all the scope of country.

672 Q. Over what scope of country, in length and in width, has that drought existed, in its great severity, that you have described?

A. I would consider a distance of 500 miles wide and probably 600 miles long, but in some places it was greater than others.

Q. And did the Rio Grande, in its general course, run through or near the center of the dry country?

A. Just seemed to divide the country in two. There was just about as much territory on one side as there was on the other, affected by the drought. In proof of that, you can see the immense importation that the Mexican Government made of cereals, corn, and wheat for the use of the inhabitants during the years 1890, '91, '92, and '93, and '94. They made no crops in Mexico during those years. If they did, theirs were very little, and they had necessarily to import them to feed their inhabitants; and another fact, they regulated the price of it, so that the inhabitants could have it wherewith to live.

Q. What was the character of the vegetation in that country, when you first became acquainted with it, in that section of the Rio Grande?

A. Well, sir, it was covered with fine grass on the Texas side. I was not then acquainted much with the interior of Mexico.

Q. At that time, how did the people grow their crops in that section?

A. By the natural rainfall.

Q. How long did they continue to grow their crops by natural rainfall after you went there?

A. Well, up to about 1888. When a drought sets in, that naturally stops all enterprises in the cultivation of the soil. We attempted to cultivate, but it was a failure.

Q. When did the drought first commence, Doctor?

A. In 1888, sir.

Q. Previous to the two years of 1886 and 1887, were there
673 any dry years?

A. Well, no; you couldn't say there was dry years. The years are pretty even. Along one summer probably might have been a little dryer than others, but still there were rains, and, as I told you, the seepage of water from that big overflow kept a pretty liberal supply of water in the Rio Grande, up to 1888 and 1889.

Q. What effect has that drought had upon the tributaries of the Rio Grande of which you have personally knowledge.

A. Well, it has dried them up just the same as the main stream, because the seep waters have ceased to exist and have become exhausted.

Q. What tributaries of the Rio Grande have you had in the past an acquaintance with?

A. Well, my principal knowledge is of the San Juan and its tributaries. I know also the Alamo, and have crossed the Cerillo (?).

Q. What character of a stream was the San Juan, when you first knew it?

A. It was a perennial stream—had a pretty fair flow above Comargo. There is a piece of river that commences at New Comargo and runs down towards the Rio Grande. It is more of a canal than a river, and when the Rio Grande is high the water runs in there and causes backwater, and when the Rio Grande is in its natural channel, then there is a very slight flow; very slight. But if there is any loss of water there, then it flows from the Rio Grande into that piece of river above New Comargo.

Q. In those early years of your acquaintance with the Rio Grande, when the rains in that section were such as to make seasonable crops, what was the population of that section of country, in a general way?

A. When I first knew Matamoras, it must have had a population of
674 over 20,000. When I knew Comargo, it had a population of about 4,500 or 5,000.

Q. Were there other settlements and towns on the Rio Grande and tributaries?

A. Yes, sir; Reynosa, San Antonio, and what was called Edinburgh. It was a port, which is now Hidalgo.

Q. What was during those years the population of that section of country, the total population of that section country, according to your best general information?

A. Including the whole area, the dry area?

Q. Yes, sir.

A. Well, the dry area, tributary to the Rio Grande—well, I should think, about a hundred thousand.

Q. Which was the most thickly settled, the Mexican side or the American side?

A. Mexican side, at that time.

Q. What became of that population?

A. Well, as the country would get dryer, and there was less enterprise, they moved off to other sections, and a great many of them moved into the interior of Texas, by the Nueces, in the region of San Antonio.

Q. What is the population of that same section of country to-day, according to your best general idea?

A. What?

Q. In numbers, what is the probable——

A. Along the river?

Q. Yes, sir; this same section.

A. Well, at Matamoras, I suppose to-day there is a population of seven thousand. Comargo has a population of about 800.

Q. At that time was Rio Grande City in existence?

A. Yes, sir; it has a population to-day of about 1,800.

Q. How much did the total population shrink there after that drought set in, and up to the present time?

Q. Well, I should think fifty per cent, including ranches also.
675 Q. What was the character of the grass over that section of country tributary to the Rio Grande when you first went there?

A. Well, sir, in my experience, as I told you, was principally with Texas, on the Texas side. In regard to the grass, it was very fine all over Starr, Hidalgo, Nueces counties, and Duval, and also Cameron and Zapata. All of these counties had very excellent grass, and there was any amount of cattle and horses, sheep and goats.

Q. What was the appearance of that grass on the ground; was it this dead, dry grass that we have up in this country, or was it green?

A. No, sir; it was. We have green grass; nice grass, comes up to the horses knees a few yards anywhere off the road.

Q. What has been the effect upon that grass and vegetation caused by this drought?

A. Well, the drought has caused the grass to entirely disappear, and as I had to attend court in Corpus Cristi during 1890 and 1892, those were the hard drought years, a portion of them. I can assure you that you couldn't fill your hat with grass from the Rio Grande to Corpus Cristi; there was no grass to be had. I went on horseback and I had to carry corn for my horse, and that is all he got from the time I started until I got to Corpus, and there we got Northern hay.

Q. What distance was that?

A. 150 miles, sir, direct line.

Q. Was it up or down the river?

A. It was direct from the river, east.

Q. What effect did that drought have upon the soil, so far as rendering it dusty is concerned?

A. It simply ruined these grass regions, because in the high winds it took up the sand and rolled it over as if it was a sand-hill desert, and created and made which we call "doones," and made immense
676 sand hills, which still exist to-day as monuments of the terrible drought. Some of the finest grazing portion of that country has been destroyed entirely by the shifting sands.

Q. Did you observe the usual effect in dry countries, after the drought set in well, about the trails being made from off on the plains where the cattle were passing down to the river?

A. My dear sir, they made perfect ruts in the ground, and the cattle that would come to the river very seldom left it, and the result was that you step almost from one water hole to another on the carcasses of dead animals in the sun with the hides on. Hides could be of no value and they didn't take them off.

MR. HAWKINS. It is now ten minutes past five, and we can't finish this examination.

And thereupon an adjournment of the hearing is taken until 7.30 p. m. of this the 14th day of December, 1899.

And now at this hour of 7.30 p. m. of the said 14th day of December, pursuant to adjournment, the further hearing of this cause is resumed. Present as before.

Dr. ALEXANDER M. HADLEY.

Direct-examination continued by Mr. HAWKINS:

Q. When did the navigation of the river practically cease, as far as regular trips were concerned, at Rio Grande?

A. About 1890.

677 Q. What has been the character of the navigation of the river since 1890?

A. Well, sir; on an average the boat could make a trip—they seldom made more than one trip a month. Sometimes they might have made two.

Q. Up to what time did that condition continue?

A. It continued along up to 1899, 1898, and 1897, when they simply made practically one trip a year, and sometimes they didn't get there at all; unloaded on the way, and would go back and send the freight up by carts. It happened almost every trip towards 1895.

Q. They wouldn't come up as high as Rio Grand City then, from 1895 on, frequently?

A. No.

Q. How many trips did the steamboat "Bessie" make to Rio Grande City in 1898?

A. I think she made two.

Q. Did you hear the testimony of the young gentleman here who used to be connected with that navigation business—

A. Mr. Thornham.

Q. About the "Bessie" having made fifteen or twenty trips in 1898?

A. Yes, sir.

Q. Would you, Doctor, have known it if the "Bessie" had made fifteen or twenty trips in 1898?

A. Certainly I would. I will tell you it is such a noted circumstance that when a steamboat comes there everybody in the town knows it and generally goes out to see her. It is a great event.

Q. Doctor, do you remember about the general facts about the flow of the river in 1897, and any floods which might have been noticeable at any time there? Do you remember any floods?

A. I think there was a rise in 1897.

Q. Do you know where it came from?

A. From the San Juan. If I am not mistaken, I think it was in the month of September.

678 Q. Was there any flood at Rio Grande City in May or June, 1897, which came down the Rio Grande from points above the mouth of the San Juan?

A. Not to create an overflow.

Q. Have you any recollection, Doctor, with reference to the legislature of Texas relieving the people of that section of the country from taxation for any period on account of the drouth?

A. No, sir; the legislature didn't do it. The application was made, but they claimed that it would be setting a bad example.

Q. What did the legislature of Texas do, if anything, towards relieving them?

A. Nothing. I suppose, further, that some of the members made personal donations.

Q. What was the character of the watershed—what is the character of the watershed of the Juan; is it long or wide or short and narrow?

A. Well, the watershed of the San Juan runs all the way from fifteen miles up to forty, but on the average it will average about fifteen to twenty.

Q. In width?

A. In width.

Q. And what is it in length?

A. I think the San Juan is about 350 miles long. It runs up near Montemorelos in the mountains, in the Sierra Madres—that branch of the Sierra Madres that runs down towards the State of Vera Cruz.

Q. Is there any irrigation along the valley of the San Juan or its tributaries or has there ever been?

A. Always has been, from time immemorial, I should say; from the time of the advent of the Spanish, and has continued down to the present day.

Q. Have you personally been at different points along its course and seen the irrigation?

A. Yes, sir; I have. I saw it, the San Juan, at Cadereyta. I have also gone to Montemorelos, and I have also been that road
679 to Monterey. The San Juan is formed by the junction of several small streams which are feeders. A portion of them rise in the mountains near Monterey and south of it. A portion of the water comes around the mountains near Cadereyta and the larger branch of the San Juan comes from the mountains of San Carlos, the other side of Montemorelos, but all of these arteries or feeders have irrigation and practically become exhausted.

Q. Have you any knowledge of any streams, large in former years—flowed regularly into the Rio Grande—which have now become dry arroyos?

A. I have. I remember three. The Zacate is one. That is at a distance of twenty-five miles from Comargo. Another that is on the south side of the river, and on the other side of the river there is one called the Rio de San Antonio which formerly was a running creek; and then there is San Pedro, which is about ten miles from Comargo, and there is a large scope of country. These three that I know of became dry in late years, and when there is any water in them at all it is simply when there is a spurt of rain.

Q. They are not known in that country any longer as living streams?

A. No, sir.

Q. Did each of these discharge into the Rio Grande?

A. Into the San Juan, and the San Juan into the Rio Grande.

Q. Was there any apparent reason for their drying up other than that suggested by the drouth condition of the country?

A. No; simply by the drouth. On these three there is no irrigation that I am aware of.

Q. At the time of the great flood down the San Juan of which you speak, there was also a great flood coming down the Rio Grande?

A. Yes, sir.

Q. That overflowed the banks?

A. Yes, sir; and the junction of these two rivers caused the immense overflow that I spoke of.

680 Q. Doctor, did the boats use to go to Comargo during the time you lived there?

A. Yes, sir; occasionally they came there. Frequently during 1865, '66, '67, and '68, and after that there was a diminution of trade entirely, and from 1868 I don't suppose that they have visited Comargo more than ten or twelve times during those years. They used to go there also and load with lead that came from Basilla.

Q. Could the boats go to Comargo now the same as they formerly could, if the Rio Grande was navigable there to the junction, or is the diminution in the water in the Rio Grande such that they could not longer make regular trips?

A. They would have some little difficulty probable, but they could go there. As I explained to you to-day, the piece of the river from New Comargo down to the junction of the Rio Grande is more like a canal than a river. It is even, scarcely any flow in it and of a uniform depth, except from the fact that when it lowers its waters, it is supplied by the Rio Grande by an inflow.

Q. How high did you ever see the water, with reference to the town of Comargo itself?

A. How high did I ever see the river?

A. Yes, sir.

A. I have seen the river all over the town, and I have seen one of the steamboats right in the plaza, probably forty feet into the plaza.

Q. How high is the town above the bed of the river—of the plaza above the bed of the river?

A. I presume it must be thirty feet.

Q. When was it that you saw the steamboat right in next to the plaza?

A. It was in 1865, when they carried the inhabitants up to New Comargo.

681 Q. Was it at the time of this great flood?

A. Yes, sir.

Cross-examination. Examined by W. B. CHILDERS, Esq.:

Q. You say you are a physician?

A. Yes, sir.

Q. Where were you born?

A. In England.

Q. Graduate physician?

A. Yes, sir.

Q. What institution?

A. I graduated twice. I graduated in the United States and graduated in Scotland.

Q. What institution?

A. Royal College of Physicians and Surgeons, Edinburgh.

Q. Where in the United States?

A. And in Cincinnati.

Q. When?

A. In '56 and '57.

Q. After graduating at the Royal Institution in Scotland, you came to this country and took a course and graduated here in '56 and '57?

A. Yes, sir.

Q. You say you located in Comargo, when—when did you come out to the Rio Grande?

A. In 1864.

Q. Where did you locate first?

A. At Comargo.

Q. And lived in Comargo up to 1880?

A. Yes, sir.

Q. And in 1880 you moved to Rio Grande City?

A. Yes, sir.

Q. I understood you to say something about cotton being carried down in the boats during the war, in the year 1864?

A. Yes, sir; '64.

Q. Where was it carried from?

A. It was carried from the Mexican side of the river, at the little town that the war had created, right opposite Rio Grande City, and was called Newton.

682 Q. Where did they take it to?

A. Down the river to Matamoras.

Q. Don't you know, Doctor, that the cotton that was shipped out of Texas was shipped out by the Confederate government, and was carried across the river in carts and wagons?

A. I know that it was carried that way, and also in steamers.

Q. What Confederate officer was in command?

A. General Bee.

Q. Where was his headquarters?

A. I think they were in San Antonio.

Q. Don't you know his report, published in the Rebellion Records, states that it could not be shipped down by the river?

A. I thought, in my explanation of it, that I told you that there was an understanding apparently between the steamboat company and the military authority in Matamoras, which was Gen. Behia, and I know that they landed cotton there.

Q. In 1864?

A. In '64, yes, sir, and in '65; and the reason that the boats were up there at Comargo when the flood came, they were in the port to get cotton, and they got what cotton was saved and carried it down the river.

Q. The boats came there to get cotton in 1864 and 1865 from Matamoras?

A. Yes, sir; that is what they did. I saw them with my own eyes.

Q. What did you say was the name of that town?

A. Newton.

Q. Newton?

A. Newton; yes, sir. It was washed away in that flood and not a vestige of it remained.

Q. What time in '65 was that great rise that you told us about?

A. In June.

Q. In June of '65?

A. Yes, sir.

683 Q. You say that furnished the waters that replenished of the Rio Grande from that time until up to '80?

A. Yes, sir; up to '80.

Q. The source of supply of the river was the water that soaked into the ground as the result of that flood from that time until 1880?

A. But it would not be uniform—the supply wouldn't.

Q. Why wasn't it uniform if it was the water that was stored in the ground in that part of Texas, from the San Juan and the Rio Grande—why wasn't the flow in the river uniform?

A. The immense overflow stored the ground to such an extent, so much was imbibed by the ground, that it could hold no more, and when the river went down it allowed these waters to percolate back again into the bed of the river, and maintained an almost uniform state of navigation up to 1880.

Q. That kept on from 1865 to '80?

A. Yes, sir; with the addition of floods that we had occasionally by local rains and by supplies from up the river and the San Juan.

Q. That was uniform, except when the amount was increased by floods coming from above?

A. Yes, sir.

Q. They did furnish some water then, the floods from above?

A. I never disputed that.

Q. Was there any other source of supply in the river except this percolation?

A. Why, certainly; the usual supply.

Q. What part of the water that ran in the stream and furnished water for navigation was furnished by this percolation, and what part from above, what proportionate part?

A. I can't tell you what proportionate part. It was enough to keep the stream in a uniform condition.

Q. I understood you to say that it wasn't uniform.

A. What wasn't uniform?

684 Q. The supply in the stream.

A. It wasn't uniform when the floods visited it from the San Juan or upper river.

Q. And the percolation furnished water all the time constantly?

A. Yes, sir; until by this seepage it became thoroughly dried, and then the loss of that seepage was apparent in 1888.

Q. The water came down from above all the time, didn't it?

A. Yes, sir.

Q. Now, I will ask you what proportion of water came from above and passed down the stream, passed Rio Grande City, and what proportion came into the stream from this process of percolation?

A. That I can't decide.

Q. You are not an expert on this subject, are you?

A. No; certainly.

Q. Your business is that of a physician?

A. Yes, sir.

Q. You have never made any study of this particular question?

A. Never made any study of it distinctively, only what I have observed occasionally and being a member of society living on that river for thirty years.

Q. What do you mean by being a member of society?

A. A citizen of that country and residing there.

Q. Have you made any study of the water percolating into the river?

A. I have seen it.

Q. How do you know that it is percolating out of that river into the land on each side?

A. It would at times after the drought had started.

Q. How did you determine that the percolation was into the bed and not out of it?

A. When you see a thing coming out anywhere you know it is coming out, don't you? By simply going along the bank of the river I would see local springs where I would see the water seep out.

685 Q. If it seeped out of the river into the soil, it would go into the soil—

A. It was almost on the line of the river, and you can see where it was dripping into the river.

Q. Where did you say the springs were?

The COURT. He has stated that the springs are in the banks of the stream and flowed out of the banks into the stream during that time.

Mr. CHILDERS. That is not percolation out of the river, that is percolation into the river.

Q. Isn't that what you call a wet-water spring that you have in any part of the country?

A. But if there is no water around it—there was not rain in that country. Now, I will tell you why I know all of this, on account of the immense lakes that remained almost full of water *of water*, and they became dry.

Q. You have never seen one of them full since 1888?

A. Yes, sir.

Q. When?

A. At overflows, but don't last long now. It will take a long term of years to replace that humidity.

Q. Is that a mere matter of opinion or observation?

A. It is observation.

Q. I understood you to say that this stretch of country was 600 miles wide by 500 miles?

A. Yes, sir.

Q. What is the southern limit, the down-river limit, of that section of country?

A. About 150 miles to Ringold.

Q. About how far is it from Rio Grande City, or Comargo, to the coast?

A. Same distance.

Q. Extended all the way to the coast, to the mouth of the river?

A. Which?

Q. This dry section of country, or region of the country?

A. Yes, sir.

Q. How far up the river?

- 686 A. I presume it reached probably near El Paso.
 Q. And three hundred, or two hundred and fifty miles on the American side?
 A. Yes, sir.
 Q. Where would that take it to the north; where would the northern limit of it in Texas be?
 A. Up to Bevel.
 Q. Where is that on the map?
 A. It is not on the map.
 Q. Well, 250 miles scaled would extend all the way to the middle of the State, would it not?
 A. Yes, sir.
 Q. And how far north of San Antonio would that northern limit be?
 A. About 300 miles.
 Q. About 300 miles north of San Antonio?
 A. No, sir. San Antonio is about 350 miles north of Rio Grande; about fifty miles north of San Antonio; and it affected that country that far up.
 Q. How far up in Mexico?
 A. To Victoria, capital of the State of Tamaulipas, and beyond.
 Q. Did you visit all that section of country from 1865 to 1880?
 A. I did.
 Q. How often?
 A. Probably two or three times.
 Q. Up to 1888, from '65 to '88, how often did you go over that section of country?
 A. Can't tell you the number of times.
 Q. How often were you down to the mouth of the river during that period?
 A. Several times.
 Q. You can't tell nor mention some of the times, nor anything about them?
 A. I used to go sometimes on a visit.
 Q. How many times did you go down there?
 A. Sometimes once in two or three years, whenever I felt like it, and sometimes business would carry me down there.
 Q. How often were you at Matamoras in all that time?
 A. I must have been in Matamoras more than a hundred times.
 687 Q. Monterey is in that section of the country?
 A. No, sir; it is in another State, Nueva Leon.
 Q. Wasn't it in that zone?
 A. Yes, sir; affected by the drought.
 Q. How often did you go there?
 A. During that drought period I was there twice.
 Q. In what years did you go to Monterey from 1865 to 1888?
 A. I was there in 1895.
 Q. Didn't go there until 1895?
 A. I was there in 1895; I was there in 1888, and I was there in 1884; well, I can't tell you the number of times. I was there in the '70's a great many times.
 Q. How many times from 1865 to 1888 were you in the capital of Tamaulipas?

A. I was twice there.

Q. When was that?

A. I was there in '94; I was there in '95.

Q. I am speaking about the period from '65 to '88. When was this drought?

A. From 1888 on.

Q. After '88?

A. During the drought from 1888 up to this year I was twice in the capital of Tamaulipas.

Q. The drought has been continuous since 1888?

A. Yes, sir.

Q. Over that whole section of country?

A. Yes, sir.

Q. How did you know that it commenced in 1888? How do you know that this water was exhausted that the ground was saturated with in 1865?

A. I have got a ranch on the river, and from newspapers and from observing the wells and observing all the conditions that would have given me a crop. Those conditions don't generally exist, and when the water supply failed at my ranch naturally my stock had to go to the river, and I had naturally to see that they were cared for, and all over our country the stock died by the hundreds. In 1888 I used to

688 brand about five hundred calves; to-day I brand fifty calves. You can see now what my loss has been. My loss was not as great as others.

Q. That is the reason you know it?

A. That is the reason I know it; simply by the observation of the local conditions.

Q. On that ranch?

A. No; not only on the ground, but from all these things.

Q. That is the reason you say that this condition extends over this whole section, three hundred by five hundred miles?

A. Yes, sir; and it can be proved by any resident in that region.

Q. How often were you at El Paso?

A. Not at El Paso, but as high up as Laredo.

Q. How far is Laredo from El Paso?

A. I suppose it is in the neighborhood of 650 miles.

Q. You say that extended all the way up to El Paso?

A. It might have; I know it got beyond Laredo.

Q. That condition extended over that section of country, with fine grass and lots of cattle and sheep and goats, and things of that kind, from '65 to '88, over that whole period of time?

A. Yes, sir; yes, sir.

Mr. HAWKINS. Do you mean between El Paso and the Gulf?

Mr. CHILDERS. I am talking about that stretch of country six hundred miles by five hundred miles, which he has described, which he says extended north up to El Paso.

Mr. HAWKINS. He said it extended up to Laredo.

Q. Did you undertake to say that that condition of things was general, without any infliction of drought or dry weather, from '65 to '88, the country was perfect, all right, plenty of water and grass, that stretch of country?

A. Up to 1888 there was plenty of grass, plenty of water, and—

Q. And no trouble about the water of any kind?

A. It was almost impossible to get to Rio Grande City in the night, when we have been out in hot weather, on account of the immense number of cattle that were lying along the road. Since then you can go from Rio Grande City to Brownsville, and I think you will not see two head.

Q. And since 1888 there has been one continuous drought all over that country without any intermission?

A. Yes, sir; you can ask any of the inhabitants of the country and find out, and they will say the same thing.

Q. Do you know it from asking the inhabitants?

A. I know it from actual sight.

Q. Don't you know, as a matter of fact, right now, between Rio Grande City and Corpus Christi, the largest cattle ranches and ranges anywhere in the United States, and in the world almost, belong to Mrs. King and others?

A. I am aware of it, and don't you suppose they lost stock?

Q. They are still in operation with cattle on those ranges?

Q. Yes, sir.

Q. They have a bigger ranch now than they had then; they have more land fenced up?

A. I am aware of it; you can't tell me anything about King's ranch,

Q. Where did they get their water from?

A. They got their water by windmills; by digging wells.

Q. And they raised the grass that the cattle ate, or dug wells?

A. No, sir; they have an occasional shower.

Q. Where did they get the cattle from?

A. I suppose they have some cattle left over, as I have, and they may have bought cattle.

690 Q. Did they have to ship cattle in to replace all those cattle that you could walk over, down there in the river bed?

A. I can't tell whether they replaced all their losses or not; I know they have been replacing them by buying more stock, and they are doing it every day.

Q. Don't you know, as a matter of fact, that Mrs. King has over four hundred thousand acres of land, and two artesian wells on it, under fence?

A. I don't know how many artesian wells she may have, but they have got lots of other wells.

Q. They use windmills to get water also?

A. Yes; they use windmills and very often don't get water enough.

Q. How do they raise the grass—raise them with the wells, too?

A. My dear sir, they have such an immense amount of land, that they have lands sufficient to allow their cattle to graze over the immense territory. They own land all the way from the Nueces River to the Rio Grande; they occupy a territory equal to almost two counties; that is, their cattle range.

Q. Didn't you say, on your direct examination, that you could go all the way from Rio Grande City to Brownsville without being able to get a hat full of grass?

A. Yes, sir; in '92—'91, '92, '93, and '94, couldn't get a hat full of grass that was raised on those prairies.

Q. And yet you admit that they have cattle there?

A. After Mrs. King lost so many of her cattle, she still had enough to commence raising again; that is, the estate had; and another thing, a great many of their cattle lived on what we call nopa, on cactus, and any brush they could get at, and lived in that way.

Q. Then they had some rain in that country?

A. Yes; a little since 1888.

691 Q. You know how many cattle Mrs. King or her son Roger have in that stretch of country?

A. No; can't tell about it.

Q. You know they have as many as eighty thousand?

A. I know that before the drought they had somewhere near a hundred thousand head of cattle, because they sold thirty thousand head of cows.

Q. How many did they lose?

A. They were like everybody else in the country; in counting them over before the drought, I expect they had perhaps seventy thousand, and did not know how many they had after, but they lost an immense number of cattle; but having such a large acreage they lost less in per cent than people who had only a few hundreds of acres of range.

Q. You know any other large cattle owners in that country?

A. Yes; I do.

Q. Who are they?

A. Mr. Fant.

Q. How many has he?

A. I don't know how many he has got, but before the drought came on he must have had thirty thousand head.

Q. Hasn't he got over 40,000 head now?

A. No, sir.

Q. You are certain of that?

A. Yes, sir.

Q. Where are his ranches and ranges located?

A. Santa Rosca (?) range.

Q. Near what town is that?

A. It is north of Corpus Christi, Atlas.

Q. You know a Larales range, owned by Kennedy?

A. Yes, sir.

Q. How many cattle they got on that?

A. Can't tell; it is not my business to find out. I know where the Kennedys have located the Larales range; it joins Mr. Fant's range.

Q. Have they as many as 50,000 head of cattle there?

A. I presume there is.

692 Q. You know John Kennedy's ranch?

A. Yes, sir.

Q. Where is that located?

A. That is located almost in the same section, farther down.

Q. Has he any cattle there?

A. Yes; he has some cattle.

Q. That near Corpus Christi?

A. Well, it is a good piece from Corpus Christi.

Q. You know Jones' ranch?

A. Yes, sir; that is a new ranch; that has been created lately.

Q. Haven't they got 25,000 head of cattle?

A. No, sir; they haven't.

Q. You mean to say that all these people have started these ranches and put the cattle on since the drought?

A. I have explained that.

Q. Do you know the Lessiter ranch?

A. Yes, sir; it is a new ranch.

Q. Where is that?

A. At Los Alamos.

Q. How many cattle have they on that ranch?

A. I can't tell; he is buying cattle every day.

Q. These ranches survived that drought with the cattle on them, did they?

A. No, sir.

Q. Have they been created since the drought?

A. Yes, sir.

Q. Are people putting cattle ranches in places where they have no grass—putting this immense number of cattle in a section of country where no grass is produced?

A. I didn't say there wasn't any grass produced. I said they had occasional rains.

Q. But I understood you to say that the country was all made up of these "doones," as you called them; didn't you say that? Didn't you say that the country was all sand hills?

A. Yes, sir.

Q. Is that the kind of country that they take these cattle into?

A. Some do; some of it. I would like to explain.

Q. If you want to explain, go ahead?

693 A. Now, I will explain to you. When the drought first struck this vicinity, that section, and the cattle began to die for lack of something to eat, to such an extent as I have described, the poorer ranchers, who didn't have large pastures, sold out at a nominal value.

Q. Then they didn't all die; they sold out?

A. They sold out some. I never said that all died. I said there was such a percentage.

Q. I understood you to say that you could walk on the carcasses of cattle from Rio Grande City to Corpus Christi?

A. That is stretching it too far.

Q. Didn't say that?

A. No. Now, will you allow me to explain? These parties who owned small herds, finding that they were not able to save their stock, the little remnant that was left—they sold out—sold them for whatever they could get, whatever they had left; but the larger owners had their immense pastures and better means of taking care of their stock, and that is the way the big ranches kept up their existence, but all the smaller ranches have disappeared.

Q. By selling out?

A. By selling out; by loss and selling out.

Q. After they lost all the cattle, what did they have to sell out?

A. Didn't say they lost all the cattle by the drought; lost a portion by the drought, and the remnant they sold out.

Q. What proportion did they lose by the drought?

A. Probably ninety out of a hundred.

Q. Only saved ten per cent?

A. That is about all.

Q. Why couldn't they get something for their cattle to eat just as well as the large cattle owners?

A. Because their pastures were fenced pastures.

694 Q. How much has been the rainfall in that country since 1888?

A. Can't tell you.

Q. Have you ever made any observation of it?

A. I have not. I haven't made it a study; neither have I had the curiosity to measure it, but it is an easy thing to measure.

Q. Did you keep any account of it?

A. I lived right near to places where they did keep account of it.

Q. But that didn't aid you any, if you never examined the records?

A. Sometimes I have examined the records, and in conversation I asked them at times the amount of rainfall.

Q. What place is that?

A. Ringgold.

Q. Now, in 1882, you say the stream went so dry that you saw little boys crossing the stream—about half a foot of water?

A. In 1882 I saw little boys and I crossed myself, from the American side to the Mexican side, by wading.

Q. Where was that?

A. In San Miguel.

Q. How far is that from Rio Grande City?

A. 21 miles by the road.

Q. Which way?

A. South; downstream.

Q. You say that the water was about half or a foot and a half deep?

A. About a foot and a half deep; yes, sir.

Q. Any boats ever come up there after that?

A. I think there was a boat came up there in October.

Q. What time of the year was it when you saw the boys crossing the stream?

A. In July.

Q. And no boats came in 1882?

A. No boats ran in six months, in July or August.

Q. No boats ever ran in July or August on that stream?

A. Oh, yes.

695 Q. What years did they run in July and August?

A. Can't tell you what years, because I know they run. Because formerly six months used to be the average time between the freshets.

Q. Never had any freshets in these months?

A. There may have been occasionally.

Q. What was the last year that you remember of any boats when any had been there in July and August?

A. I don't think I have known any boats to come up there since 1878.

Q. Now, I will ask you, going back to the cattle business, do you know Fatune?

A. Yes, sir.

- Q. How far is his ranch from where you live—in what vicinity?
- A. I don't know his ranch; know the section of the country in which it is. It is down near the sea.
- Q. How far from there—what county is it in?
- A. In Cameron County.
- Q. You say you don't know how far it is from where you are?
- A. I can calculate, more or less.
- Q. About how far?
- A. From Rio Grande City?
- Q. Yes, sir.
- A. I suppose his ranch must be 125 miles.
- Q. Do you know how many cattle he has there? Don't you know that he has as many as 60,000?
- A. I am not aware that he has.
- Q. Do you know anything about how many he has?
- A. I do not. I know that he has got a good ranch.
- Q. Do you know the Laurel's ranch?
- A. Yes; I know it. I know simply where it is located.
- Q. You know how many cattle they have there?
- A. May have 60,000 or 70,000 head of cattle.
- 696 Q. You know John Kennedy's?
- A. Yes, sir.
- Q. Where is that with reference to Rio Grande City?
- A. That lies southeast.
- Q. Know how many cattle he has?
- A. I do not.
- Q. About 25,000?
- A. He may have 20,000, probably.
- Q. You know Jones's ranch?
- A. Yes, sir.
- Q. Has he 25,000?
- A. Jones's ranch is a new creation; been created in the last few years.
- Q. Has he 25,000 head of cattle there?
- A. I don't think so; probably 12,000.
- Q. You know of the Viscaya cattle?
- A. I don't think he has got any in his name now; he sold them.
- Q. When did he dispose of them?
- A. Sold them out last year.
- Q. How many did he have last year? You know the range?
- A. Yes; I think he had about 5,000 head. The most of them were brought from Mexico.
- Q. The cattle are still on the range?
- A. I don't think he has got one on the range.
- Q. But the other people that bought them from him?
- A. I don't know anything about that.
- Q. Do you know Mrs. Kennedy, who has got a hundred thousand cattle there?
- A. I do. We have already figured on her.
- Q. And Roger King, 35,000; her son?
- A. I suppose that the son and mother are the same thing.
- Q. Stayton?

A. I don't know anything about Mr. Stayton's ranch.

Q. Do you know where it is?

A. No, sir.

Q. You don't know anything about any such ranch as that—son-in-law of Mrs. King?

697 A. Don't know anything about that.

Q. Ward & Rundle's ranch—you know anything about that?

A. Yes, sir; I know that range.

Q. How many cattle on that range?

A. I suppose 2,000 head.

Q. No more? Don't you know that they have 20,000?

A. No, sir; I don't. I don't believe they have.

Q. The J. McCowland ranch?

A. Yes, sir; I know it very well.

Q. Have they 25,000 on that ranch?

A. If they have got 9,000, that is about 4,000 more than they got.

Q. Haven't they got 18,000 advertised for sale right now?

A. I don't know.

Q. Don't know whether they have or not?

A. No, sir.

Q. Do you know the Lessiter ranch?

A. I do.

Q. Where is that? Do you know how many they have?

A. I can't tell.

Q. Do you know if they have 40,000?

A. No; I don't.

Q. Know anything about the Sprague ranch?

A. Don't know anything about such a ranch.

Q. Do you know whether there is any such ranch as that?

A. There may be such a ranch.

Q. Don't you know that they have 35,000 head of cattle there—the Rhode Island Sprague, Governor Sprague?

A. I don't know how many cattle he has got. I know that he has not got the number that you speak of. I don't think he has got 9,000 or 10,000.

Q. You know the Wells ranch?

A. Yes, sir.

698 Q. How many cattle they got there?

A. About 500 head.

Q. No more than that?

A. No more than that.

Q. How do you know?

A. Because I know that he has not got them. I have been there.

Q. When were you there last?

A. I was there about a year ago.

Q. And did you investigate the number of cattle?

A. I inquired.

Q. And he told you?

A. He had sold out all his cattle, and he hadn't bought any since.

Q. You are satisfied of that? I am asking you about the number of the cattle on that ranch—whether they were the same cattle there that these parties bought?

A. There is a very small herd of cattle; it belongs to Mr. Champion; I suppose 700 head.

Q. And no more?

A. No more.

Q. Isn't it a fact that all these ranches and ranges that I have asked you about are in that belt of country which you say has been so dry since 1888?

A. Yes, sir.

Q. And there are a great many others that I have not mentioned?

A. I think you have got them all, about. I think you have got all the cattle in that country; I don't think you let one get away.

Q. Now, in 1896 you say charitable donations had to be made?

A. No, sir; '91, '92, and '93.

Q. That the people had to be succored from starvation?

A. By charitable donations.

Q. You ever hear of that taking place anywhere else except on the Rio Grande River—droughts and failure of crops?

699 A. No; I am satisfied that if the people of the United States would have known of the situation they would have considered it one of the worst famines that ever assailed the people.

Q. And for three years they lived on charity—the people below Rio Grande and Camargo?

A. Yes, sir; lived on charity.

Q. How did the people over in Old Mexico live?

A. I don't know; I suppose that whenever they got hungry they came over to us and got a little of what we had.

Q. They came over on this side of the river for charity, did they?

A. Yes, sir.

Q. Now, you say there were many years—speaking about these steamboats coming up there—that the steamboat never made but two trips; when did that condition of things commence?

A. From '90.

Q. From '90 up, you say, the steamboats have never made any more trips than that?

A. That is my impression.

Q. Is that more than an impression; do you swear to it?

A. Swear to it positively.

Q. How do you know that?

A. Because I live right on the bank of the river.

Q. And they never come up there without your knowing it?

A. I don't think they could get through without my knowing it.

Q. You say that in 1890 not more than two trips were made?

A. I think they would only average about two trips a year.

Q. How many were made in 1890?

A. I can't tell you how many in that year. I say it would average about two trips the whole ten years, from '90 to 1899.

Q. How many trips were made in 1891?

A. Can't state.

Q. What boats made the trips in 1890—the two trips that you are talking about, or the trips that were made?

700 A. The "Bessie."

Q. No other boat?

A. No other boat.

Q. How many trips were made in 1891; you say you can't tell?

A. I suppose there was probably two trips made that year.

Q. No more?

A. I don't think there was any more.

Q. I am not asking you about your opinion, but what you know.

A. That is what I know.

Q. Could there have been any trips made that you didn't know of?

A. There might have been, but I am not aware of it.

Q. I am asking you for your knowledge—

A. I don't think they made more than two trips in '91.

Q. In 1892 how many trips were made, that you remember?

A. Probably two.

Q. In what month were these trips made *in*, in 1891 and 1892?

A. Well, I can't tell you the months; different times.

Q. Were they made in the fall, spring, or winter time?

A. I suppose one was made in the spring and another in the fall.

Q. What makes you suppose that?

A. It was the more favorable stages of the water.

Q. How do you know that would have made it more favorable?

A. Because we sometimes have a small rise from the San Juan.

Q. I am not asking you what you sometimes have, but what you remember of it. Do you remember that you had a small rise in the San Juan in the spring?

A. We had it in the fall and October; didn't have any in the spring.

Q. You are positive that you had one in the fall? How far up did the boat get in the spring? You said it came up and stopped

701 before reaching Rio Grande whenever it didn't come on a rise.

A. I don't know how high it got up.

Q. Isn't it a fact that she always got up as far as Rio Grande anyway?

A. No, sir; let me tell you, sir, that since 1880 the trade with Brownsville and the upper country has been decaying to such an extent that now that trade no longer exists. The steamboat company had to take in packages and bundles until they could get a load; probably it would be four months in congregating a sufficient cargo to cause them to make the trip, unless they brought some hay or something of that kind to the garrison. Now, sir, when they would have water, why, they would run, but as soon as they struck a sand bar, then they put a capstan on, and with the steam generated they would work her over that shoal, and sometimes probably turn her stern around and let her work until she cut her way through, and the same process was going on until they were finally stuck. Whenever they got finally stuck they would get out and congregate all the Mexicans with their carts and haul the freight up the river. That is the kind of navigation they have had.

Q. Did you ever see them do that?

A. Yes, sir; I have seen them do it.

Q. When did you see them do that?

A. I have seen them a great many times in the years past. Why, they did it this year.

Q. Where and when?

A. They were right at the Guyo ranch.

Q. And you saw the Mexican carts go there and get the goods?

A. Yes, sir; I saw them coming into town with the goods, and I saw the gentleman when he went to get the carts to get the cargo.

Q. On what other occasion did you see that?

702 A. I have seen it nearly every year since '90.

Q. And never did see it before 1890?

A. Never saw a boat on the sand bar before ninety? Sometimes they would make a trip through without a great deal of trouble, and sometimes they would have lots of trouble?

Q. But you never saw a boat on a sand bar before '90?

A. Yes; but it wouldn't stay very long.

Q. How long would that be?

A. I think they were six weeks in getting back to Brownsville; I don't know the boat—did not keep run of it.

Q. How do you know how long it took her?

A. Simply from hearsay and knowledge from merchants.

Q. They is why you know most all the facts that you have testified to here?

A. No; not that way. It is a fact, and can be proven.

Q. Will you swear to it?

A. I will swear to it.

Q. Now, you say that all the farming that was ever done on the tributaries of the Rio Grande around Comargo and that section of the country was done by natural rainfall?

A. No, sir. I said this: That the planting now and the corn raised down there was raised by natural rainfall?

Q. In that immediate section you limit that to the planting of corn on the Rio Grande?

A. Corn, cotton, and sugar cane on the Rio Grande.

Q. Have you ever done any cultivation on the Rio Grande near Comargo, except by natural rainfall?

A. None at all.

Q. Now, on the San Juan, where do they first commence to irrigate?

A. Oh, they commenced in the time of the Spaniards.

Q. You were there then?

A. I should have been.

Q. How far up from the mouth of the river do you strike the first irrigation on the San Juan?

703 A. Now?

Q. Yes.

A. About five miles from the mouth of the San Juan.

Q. Where they commence to irrigate?

A. There is one little ranch there that irrigates.

Q. Whose ranch is that?

A. It belongs to Luis Isigen.

Q. How many acres of land does he irrigate?

A. I can't tell; I wouldn't hazard. He irrigates with an engine.

Q. Pumps water up out of the stream?

A. Yes, sir.

Q. Are there any irrigating ditches taken out of the stream there? How far above the mouth of the San Juan before you strike the first irrigating ditch?

A. As near as I can remember, it is Paso Zacate.

Q. How far is that above Comargo?

A. About forty-five miles.

Q. How much land is irrigated there?

A. I can't tell you.

Q. Have no idea at all?

A. Have no idea. There is a Mr. Peña got a piece of land there that is irrigated.

Q. What is his first name?

A. Ramon Peña.

Q. Anybody else?

A. Yes; there are others.

Q. Give the names of all you can recall.

A. I can't remember many names, but there are other parties there.

Q. Can't you give any more names?

A. No; don't remember the others' names just now.

Q. What amount of land is irrigated there?

A. Have no idea of the quantity of the land.

Q. Haven't any impression at all?

704 A. Never surveyed their lands.

Q. Ever hear how much there was?

A. Never heard.

Q. Has there been any increase or decrease in the amount of land under irrigation at that point within the last fifteen years?

A. Since the drought set in I don't think they irrigate at all.

Q. That is, since 1888?

A. About ninety, probably.

Q. From 1880 to 1890 was there any increase in the amount of land under irrigation there?

A. Not that I know of.

Q. Now, going on up the stream, where is the next point where ditches are taken out and land irrigated?

A. At La Bravo.

Q. Know anybody whose land is irrigated there?

A. Well, yes.

Q. Give the names.

A. The Garzas.

Q. Give the first names of any of them.

A. Well, there is a whole tribe of them.

Q. How much land is irrigated there, if you know?

A. Well, I can't tell you.

Q. Any increase or decrease in the amount of land irrigated there within the last ten years?

A. I have no idea how much.

Q. When were you last there?

A. I haven't been up there since—I think the last time I was up there must have been about 1885.

Q. When were you last at that place you mentioned just before this latter town?

A. I think I was there somewhere about 1887.

Q. Now, going on up the river from the Garzas place, what is the next place?

705 A. The next place above Bravo, you mean?

Q. Yes; above the place where the Garzas is?

A. China.

Q. How far is that from Bravo?

A. It is about three or four miles.

Q. How much land is irrigated there?

A. I don't know; I don't know that they have got any irrigation there.

Q. That is what I am asking you, the next place where the land is irrigated above Bravo, where Garzas was?

A. I don't know that they have got any irrigated lands there; I didn't see any.

Q. Where is the next place above China?

A. A hacienda called Miaquitas.

Q. Any land irrigated there?

A. Yes, sir; got a good ditch there.

Q. When were you last there?

A. I think I was there—must have been about 1884. I slept there one night.

Q. You know when they put that ditch there and commenced to irrigate the land now and then under irrigation?

A. That ditch is very old.

Q. Don't know that there has been any increase or decrease?

A. Can't tell you anything about the amount of land in cultivation there at all, but it used to be and I suppose to-day is a very improved ranch.

Q. What is the next place?

A. The next place that I remember of seeing irrigation is the city of Cadereyta.

Q. How many people irrigate land there?

A. The whole of that region is irrigated. It is quite a large place.

Q. When were you there?

A. The last time I was there, I think, was in 1887.

706 Q. State how much land is under irrigation at that point.

A. I was there also in 1894.

Q. You were there in 1894?

A. Yes, sir.

Q. Is that on any railroad?

A. Right on the railroad.

Q. Which road?

A. The Monterey & Gulf Railroad.

Q. How much land was irrigated there?

A. I couldn't tell; it is a large town and they live on the products of that irrigation.

Q. Been there a long time, hasn't it?

A. It has; the very town was named from the Viros of Mexico.

Q. There has been no increase in the irrigation—none that you know of?

A. I couldn't tell whether there was any or not.

Q. Go on up the stream; where is the next place?

A. The stream there unites with another little stream; then you go on towards Monterey.

Q. Any increase in irrigation up that direction, that you know of, for the last fifteen or twenty years?

A. I can't tell you.

Q. Now they are endeavoring to irrigate from the San Juan River; I presume that is the way they live?

A. Yes; that is one way they live—by raising their crops.

Q. But they have been starving since the drought?

A. Once in a while they raise a crop.

Q. Then the San Juan hasn't dried up?

A. There are times when it is entirely dry.

Q. It furnishes enough water to irrigate in the summer time, doesn't it?

A. They have not had any irrigation for the last few years, to any extent.

Q. You haven't been up there since 1884?

A. I was there in '95.

Q. Didn't you state you were there in 1884?

707 A. I was at Matamoras in 1895; it was also on a branch of the San Juan.

Q. What time of the year were you in Matamoras?

A. I was in Matamoras in July.

Q. And you were not asked if they had irrigation there?

A. They had not been any water, and in consequence they had no irrigation.

Q. Did they attempt to cultivate the lands?

A. They had made a poor crop of corn.

Q. There had been irrigation there?

A. It was suspended simply on account of the water supply not being sufficient. Some years they have irrigation and have had plenty of water. When there is plenty of water they have splendid irrigation.

Q. You know Linares? Been there?

A. Yes, sir.

Q. What stream is that on?

A. Well, I don't know the name of the stream; it is not on the San Juan.

Q. Any tributary of the San Juan?

A. No, sir.

Q. Are there any sugar plantations there?

A. Yes, sir.

Q. Are they in cultivation?

A. Yes, sir.

Q. You don't know whether that is on a tributary of the San Juan or not?

A. No, sir.

Q. How far is that from Comargo?

A. Must be about 180 miles.

Q. What direction?

A. South and a little west.

Q. What railroad is it on?

- A. Upon the Gulf road.
 Q. Monterey and Gulf?
 A. Yes, sir; that is where they get their principal orange supply from.
 Q. The lower part of the San Juan has been practically dried up since 1888?
 A. Yes, sir; except when there would be a flood or a freshet.
 Q. You are positive of that, and swear to it?
 708 A. Yes, sir.
 Q. That there has been no perennial flow in the San Juan?
 A. I wouldn't so state, but there were portions of the year when it was entirely suspended.
 Q. But there have been portions of the year when there wasn't any water flowing through the stream at all—every year since 1888?
 A. In every year.
 Q. How many years has that been the case?
 A. One or two years that I passed over, I seen it in that condition.
 Q. What years were those?
 A. Well, I will give you the years. Last year—
 Q. What month last year?
 A. Last year, in May.
 Q. Well, the other year?
 A. The other year was 1897?
 Q. What month?
 A. I think it was August.
 Q. Those are the only two years that you swear to positively?
 A. Yes; but there were portions of the river where there was no apparent current, and no water visible.
 Q. No water visible and no apparent current?
 A. Only standing in pools.
 Q. Now, you said the population of this dry area of 500 by 600 miles was a hundred thousand on the Mexico—
 A. On both sides, probably.
 Q. A population of a hundred thousand?
 A. I suppose it would reach that.
 Q. That includes Matamoros?
 A. Yes, sir.
 Q. That had 20,000?
 A. I said it had 7,000.
 Q. And Comargo had four or five thousand—
 A. And to-day about 800.
 709 Q. And you put the population of that area at one hundred thousand on both sides of the river?
 A. Yes, sir.
 Q. City of Monterey in that stretch of country?
 A. No.
 Q. How far is Monterey from the Rio Grande River?
 A. I suppose about 200 miles.
 Q. That would be within that 250 miles, if it is on that side of the river.
 A. Well, yes; it would.
 Q. How do you know the population in that stretch of country?

A. Just simply from information.

Q. What information?

A. And also by my personal knowledge.

Q. What information?

A. From statistics.

Q. Could you give the population of the various counties in Texas in that area?

A. All the counties—I may not be able to name them; if I had a map I could point them out.

Q. Has there been any census in Old Mexico of the population in this district of country?

A. Yes, sir.

Q. When was the census—what census?

A. They take a census every five years in Mexico.

Q. Know when they took it last?

A. I do not.

Q. You say the population shrank fifty per cent in that stretch of country?

A. Yes; at least, including the ranches.

Q. On both sides of the river?

A. Oh, yes.

Q. You are positive of that?

A. Yes, sir.

Q. Between '88 and when?

A. Up to date. Now, if we had a map I would like to have you run over that and see how much I am in error.

Q. Have you ever had any difficulty with Mr. William Kelly? You know him, don't you?

A. Mr. Kelly and I are warm friends.

Q. Never had any trouble with him?

A. No, sir.

Judge FALL. Is Mr. Kelly a party to this suit? Does it go to his interest?

710 Q. You say navigation ceased, as far as regular trips were concerned, in 1890?

A. Yes, sir.

Q. You are positive of that? What do you mean by regular trips?

A. Tell me what you mean by regular trips.

Q. What do you mean by regular trips?

A. That is what you have got to tell me. You ask me if regular trips ceased; I think you ought to tell me and explain to me what you mean by regular trips.

Q. You have used the word "regular;" I will ask you to define what you mean by that?

A. I think you ought to tell me, so that I can answer.

Q. I would like to know what you meant by that expression when you used it; did boats go up there twice that year?

Mr. HAWKINS. If the court please, that has been dragged over and over.

Q. You say you have been engaged in practicing medicine all the time up to date—you have been engaged in practicing your profession all the time?

A. Ever since I have been in Mexico I have been practicing my profession, and also been a merchant.

Q. And you have lived at the two places mentioned accumulating and gathering information?

A. Yes, sir; and a portion of a year in Tampico.

Q. Your practice has been principally where you resided?

A. Yes, sir.

Q. Required you to stay at home pretty closely, didn't it, to attend to it?

A. I have seen a good deal of Mexico. You must remember I was a merchant twelve years, and that caused me to do a good deal of coming and going in Mexico during those years, although I practiced a little medicine among my friends. When I ceased to be a merchant, I took up my old profession.

Q. When did you cease to be a merchant?

A. In 1875.

711 Q. Even since 1875 you have been engaged in practicing medicine in these two places?

A. Yes, sir; except in Tampico, where I was once.

Q. You said something about some streams being dry that used to run into the Rio Grande. What streams were they?

A. The Zacate.

Q. Where did that empty into the Rio Grande?

A. Don't empty into the Rio Grande; into the San Juan.

Q. And through the San Juan into the Rio Grande?

A. Yes, sir.

Q. Whereabouts did it empty into the San Juan?

A. At a place called Zacate.

Q. How far from the mouth of the San Juan?

A. About 45 miles.

Q. When did that cease to flow?

A. Well, I can't tell you, but I knew it when it was a broad running stream in the seventies and in the eighties it was still running a little, but in the year 1890 it had entirely ceased to run, and is dried up to-day.

Q. And hasn't run any since '90, except in floods and freshets?

A. That is all.

Q. What were the other two streams that you mentioned?

A. The other one was the San Antonio.

Q. That above or below?

A. That was below the one I speak of.

Q. Was that between Comargo and the one you speak of?

A. Yes, sir.

Q. How far above Comargo was that one?

A. It must be some fifteen miles.

Q. When did that cease to flow?

A. That ceased to flow sometime about—must have been sometime about 1883 or 1884.

712 Q. How big was that stream?

A. Well, when it runs, it has a tremendous flow of water coming through it.

Q. Yes, but I mean ordinarily?

A. It is a very small rivulet when I crossed it at times.

Q. About how much of a stream—how wide and how deep?

A. It might have been probably two yards wide and half a foot deep.

Q. Never run any less water than that—before '90, I mean?

A. I don't know.

Q. How big was that other stream?

A. It drained an immense country.

Q. I am speaking of close to its mouth—how much was that, how wide and how deep?

A. When it enters into the San Juan, it is a very deep gully.

Q. How much water was in it when it run?

A. It must have had probably half a foot of water at its lowest, and probably it was three yards wide.

Q. Now the third stream—what was the name of that?

A. That is the San Felipe, that I speak of now.

Q. There are three of them—the San Antonio, San Pedro—

A. San Pedro, San Antonio, and San Felipe.

Q. What was the size of that one?

A. That was a stream in the seventies, probably about four yards—four to five yards—wide, and probably eighteen inches deep.

Q. Now, do you know of any stream that used to flow perennially into the Rio Grande that have entirely dried up anywhere? I am talking about those that emptied direct into the Rio Grande.

A. No, sir; I don't know of any streams that emptied into the Rio Grande, after the San Juan, except dry arroyos or dry creeks, which are another thing when it rains.

713 Q. Above the San Juan, did you know of any where they used to run into the Rio Grande, except in freshets and flood times?

A. No, I don't know of any.

Q. Don't know of any such condition of things on the Rio Grande?

A. Have no knowledge of the river much above the Alamo; that is a little river that comes in near Mier.

Mr. CHILDEERS. I think that is about all that I want to ask this witness.

E. E. NEAL, another witness on behalf of the defendants, being called, and having been duly sworn to testify the truth, etc., and being examined by Mr. HAWKINS, said on direct examination:

Questioned by Mr. HAWKINS. Where do you reside and what is your business?

A. I reside at Alamogordo, New Mexico; am an attorney by profession.

Q. Did you ever reside at Rio Grande City, on the Rio Grande River, in the southern part of the State of Texas?

A. Yes, sir.

Q. From what time and to what time?

A. About the 26th of November, 1896, to the 4th or 5th of March, 1899.

Q. During the time of your residence there did you have any occasion to observe the character of the navigation of the river at that place, and immediately below there, and the character of the flow of the river?

A. Yes, I had some; you might say considerable.

Q. Was your observation of the river—the flow of the water and the character of navigation past there—sufficient to give you a pretty correct idea of it?

A. Well, it was for that length of time. Anything outside of that is mere hearsay.

Q. What was the character of navigation that obtained there, so far as known by you?

A. Well, I know that the boat, from the time that I got there until I left, made five or six trips—I can't say which, whether it was five or six—that is, up the river, up the Rio Grande—three times that I know of. Twice she unloaded at what is called the Leybruya, fifteen miles by land. She hung up below Fort Ringold, twice right close to the fort and one probably half a mile down or so.

Q. Was there any particular reason why you observed the trips of the steamer into that place, or in its vicinity, from any lower parts of the river during those years?

A. Well, yes. After the first trip, for a mere diversion, I took the San Antonio Express and acted as their correspondent, and then a little later on the Galveston News, and of course that was an interesting item of news; would send them notices of what she brought up, and that happened to be some of the most important news that we had; also the movement of the troops of Fort Ringold. I spent most of my leisure time in the company of the soldiers. I was acting as county attorney and United States commissioner. I was around the post a great deal, except when the boat came in. Mr. Jessie Thornham, the captain, and brother of Mr. Albert Thornham, who testified here, and I were particular friends. There was only a few American citizens there, and only
715 three American families. I always made it a point to meet the boat when they came up, and have as much fun and pleasure out of it as I could.

Q. Did you ever go to the bend, or where the boats unloaded, where she did unload?

A. I wasn't there at either times. I know that the freight she brought up had to be transported to ox teams and brought up to the fort in that way. I have been down to that point several times hunting.

Q. During the period you were there, how did the people get their supplies which came from a distance?

A. There was a string of ox teams going and coming from Hebronville continuously, and also horse and mule teams, and there was some opposition there. The stage carried express and mail.

Q. What per cent of the freight of that country came in by that overland transportation, do you suppose?

A. Well, I couldn't give that from personal knowledge. I can only say that the class of freight, or freight that was brought up on the boat, was freight brought around by steamer—across that twenty-mile road to Brownsville, and then up by boat would be from four to six months collecting, and waiting for the water coming up, and I don't believe in these five or six trips that they could have brought up to exceed five per cent.

Q. How far is Hebronville from Rio Grande City.

A. Hebronville is 85 miles.

Q. On what railroad was Hebronville?

A. On the Texas and Mexican, a short narrow-gauge that runs from Corpus Christi to Laredo.

Q. Were you at Rio Grande City during the flood they had in El Paso in 1897?

A. Yes, sir; not all the time. I went to Federal Court on the first of January of that year.

716 Q. Did you have any occasion of any kind to remember the fact of a flood at El Paso; how did you obtain your information?

A. I always noted by the daily paper, and the post operator at Ringold always kept posted all along the line, the operators from Carrizo and Laredo kept each other posted. There is a government line that runs to those places, and the officers of the post would get the information from their operator of the state of the water along the river, anything unusual.

Q. Did the floods which passed El Paso in 1897 have any appreciable effect at Rio Grande City?

A. Well, that I can't say, only just by newspaper reports and from what other old residents told me, and so on. I will say that I took quite an interest in flows of water, but I know it was a long time after the flood at El Paso before we felt any rise there. I know it was a long time before we felt any, noted any rise, and then very soon after the reports of rise at El Paso I saw reports of other rivers rising, Pecos and Concho and San Juan.

Q. Now, then, when was it that there was any rise in the river in 1897 at Rio Grande City?

A. I couldn't say what time; in June, I think, but I wouldn't be positive, although I know I wrote it up from day to day. It occurs to me the latter part of June or fore part of July.

Q. Did the river get out of its banks?

A. Well, it cut off on the Mexican side and flooded the bottom there where they raise a little crop of cotton, and near the intake pipe of the water works at Fort Ringold, so they had to pump the water up there into settling tanks. It changed the course of the channel, as it always does during those floods, or has been doing for some years up the Mexican side, a quarter of a mile, about an eighth of a mile where this pipe was.

717 Q. And you say that was the flood which you heard of as coming from the Pecos or Concho subsequently to the reports of a flood at El Paso?

A. Yes; I suppose that it was united.

MR. CHILDERS: We object to suppositions.

MR. HAWKINS: All right.

WITNESS: As I said in the first instance, I couldn't say from my own knowledge, only from what the citizens were talking about.

Cross-examination:

Examination conducted by Mr. CHILDERS. You say you have been a practicing attorney, or had been all the time at Rio Grande City?

A. Yes, sir.

Q. Not engaged in any other business?

A. Only United States commissioner, that occupied me with a few Chinamen's cases under the exclusion act.

Q. That was in the line of your business?

A. Yes; and I was county attorney.

Q. Not engaged in any other business?

A. Nothing practically; no. I have made some cattle deals for parties outside; helped to sell land, and so on, as we attorneys sometimes do.

Q. What time did I understand you to say that you went there to reside?

A. In November, 1896.

Q. And remained there until the 4th or 5th of March, 1899?

A. I resigned as United States commissioner, I believe it was the last day of February, and left there about the 4th or 5th of March.

718 Q. Did you pay any particular attention to the river while you were there?

A. Yes; on account of these newspapers. Under our instructions, as all reports know, on these papers, we are asked to wire of any rain or any sudden rise in the river, or anything of that kind, to the papers, and paid particular attention on that account.

Q. That would be sudden rises?

A. Yes, sir.

Q. Wasn't any more than once or twice a year?

A. Well, I reported, I think, two or three. I reported what there was.

Q. Didn't report daily stages of water in the river?

A. Oh, no; just sudden fall in rain or rise. And when the boat came up would report what luck she had, if any accident, and so on.

Q. During the three years that you were there?

A. I was not there for three years; two years and about two months.

Q. How many trips did this boat make?

A. I think five or six.

Q. You don't undertake to say whether it was five or six?

A. No, sir; wouldn't be positive.

Q. That was the "Bessie?"

A. Yes, sir. I know that two trips she only came as far as Carrizo.

Q. How many did she have in her crew?

A. There is always a lot of Mexicans working round the crew. I never got to the "Bessie" before she landed at any time. I never counted the Mexicans; just talked with Tom Brown, and so on, and asked him about what kind of a trip they had had, and etc.

Q. The boat never reached Rio Grande City?

A. No; it came to Fort Ringgold; never does go to the city. There is a sand bar there, so that it couldn't get past; it loads below the post.

She came up there three times, and twice she couldn't get up that far.

719 Q. She came up twice to Ringgold?

A. Three times. I say she got up three times, that I know of, to Fort Ringgold.

Q. I mean all the way up to Rio Grande City?

A. It is one and the same thing.

Q. And twice she didn't get up?

A. To the Guyo.

Q. How far is that?

A. 15 miles, I understand.

Q. Is that her usual landing place?

A. I don't know. I know she couldn't get up any further.

Q. How did you know she couldn't get up any further?

A. Well, I suppose more from what I have seen. Have seen the teams coming up, and four or five of the boys told me she couldn't. Mr. La Casse and the captain would walk or come in on horseback.

Q. Now, when were these two trips?

A. Well, one of them was a trip just preceding the time that the Mexican engineer, Allanaya, or whatever his name is, had come and sent for the boat.

Q. That was one of the trips when he sent for the boat?

A. I say that one of these trips she stopped at La Guyo—was the trip she made—was the time that he sent for her. I don't know how long before he sent for her.

Q. How did the captain of that vessel—of that boat—make a living? Did he make a living steamboating on the Rio Grande?

A. I never asked the gentleman that question. I haven't been told how he made a living.

Q. You say that during that period of time that you were satisfied that that boat didn't bring up only five per cent of the freight?

A. I don't think that she brought up, during those five trips that I know of—that I am quite certain of—to exceed five per cent of the freight that was handled in that town.

Q. That is just a guess, practically, on your part?

720 A. Well, I told you she brought up a good deal of hay and stuff for the post there. A good deal of her stuff was for Fort Ringold. Captain Kelly had a contract to furnish stuff there.

Q. You don't know anything about what the boat brought up to intermediate points?

A. What they brought up to Hidalgo I don't know, except as to one trip—that is the fall trip of 1897, when the big flood was, along in September; somewhere along there. That is the time that she had twenty-seven days or something—had a very perilous trip—and she unloaded the greater portion at Hidalgo, and, I believe, one other trip, but what that consisted of, I don't know.

Q. You say that there was a rise in the river at Rio Grande City in July or August?

A. It might have been the latter part of June, I said.

Q. Sure that wasn't the latter part of June?

A. I say if my memory serves me right.

Q. You think it was as late as the 20th of June?

A. I think it was the latter part of June, if my memory serves me right.

Q. And was there any other rise that year?

A. In the fall.

Q. You say in the fall you had a rise. What month?

A. I can't say exactly as to the month. It occurs to me now that it was the latter part of August or the fore part of September.

Q. Did you know that in June and July there had been any rise in the San Juan, Pecos, or any of those other streams?

A. I know that in June there was a big rise in the San Juan, because

I went over to Camargo quite frequently. I went hunting with a man named Oliver Austin.

Q. What time in June?

721 A. That was the latter part of June, as I say, and I know the whole country was all flooded.

Q. What time was that flood reported in El Paso in the summer of '97.

A. It occurs to me now that that was reported—might have been the middle of May; somewhere along there.

Q. Middle of May?

A. Yes, sir; probably April?

Q. Wasn't it in June?

A. I think it was not. I think it reached its height in the latter part of May sometime. We had two or three reports.

Q. The time that it became so destructive at El Paso?

A. That was the time we paid the most attention to it.

Q. What time was that?

A. I say I think it was along between the middle and the latter part of May.

Mr. CHILDERS. That is all.

WITNESS. I wish to state how I know about these trips of the boat so well. I knew Mr. Thornham quite well, and he generally had charge of the boat's affairs and knew more than anyone else about the boat. I was under the impression that they made three trips in 1898, but I see that Mr. Jules la Casse says in his affidavit that they only made two. I rather trust to him than to myself, for the reason that he was one of the representatives of the boat.

Q. You adopt his two?

A. I don't adopt anybody's statement. I just simply say that as an explanation.

Mr. HAWKINS. You say Mr. la Casse is the agent of the boat?

A. When we wanted to know anything about it we always went to him or to Mr. Thornham. Mr. Thornham looked after the freight, receipted for it, and so on.

722 OLIVER T. REED, another witness introduced on behalf of the defendant and having been duly sworn to testify to the truth, etc., on being examined by Mr. Hawkins, said on direct examination:

Q. (By Mr. HAWKINS.) Please state your name, age, and residence.

A. My name is Oliver T. Reed, my age is 62, and live at Laredo, Texas; am day collector of the bridge there. Receive all the money which is taken on the bridge at the American side and deposit them in the national bank.

Q. How long have you held that position?

A. Sixteen months.

Q. How long have you lived at Laredo, Texas?

A. Twenty-two years.

Q. Where did you reside before going to reside there?

A. Prior to my going there I lived in Rockport 7 years and Corpus Christi 2 years. Went to Corpus Christi about 1875, and lived there until '77. Lived at Laredo ever since.

Q. How long have you known the Rio Grande River?

A. Ever since 1857.

Q. Where did you first see it?

A. At El Paso.

Q. Did you reside at El Paso?

A. I resided at El Paso years—from 1857 to 1864.

Q. What was the character of the flow of the Rio Grande at El Paso, Texas, in those years?

A. During the summer months the river seemed to have plenty of water, in the winter months it was always low, with the exception of 1862 and '63 it went entirely dry. Before that I don't remember of there being a year that it didn't have some water during the winter time, but very little.

723 Q. How do you know it was dry in 1862 and 1863?

A. I was in Chihuahua. I left in '62 to go to join the Confederate forces in Louisiana, and was taken sick at Chihuahua, and they went on and left me to return. They furnished me with a horse and I rode up the river to El Paso.

Q. How far below El Paso did you strike the river and find it dry during that time?

A. I think it was thirty miles below El Paso, more or less.

Q. Was it dry all the way up?

A. A pool of water occasionally, but you could go right up the bed of the river without want water.

Q. When did you leave El Paso and go down to the Lower Rio Grande?

A. I left in 1864; proceeded from there to Presidio del Norte.

Q. How extensively did you travel in those early days over the lower part of the Rio Grande?

A. What do you call the lower part?

Q. The parts at which you stationed yourself.

A. I was over at Presidio del Norte a short while, and then I left there and went over the mountain to Piedras Negras, and got there in the fall of '64. I remained there off and on for six or eight months at what they call Porfirio Diaz.

Q. Did you travel out extensively over the Rio Grande on the Texas side at any time during those years?

A. On the Texas side? No, sir; I don't believe I went over to Laredo to remain until in 1876.

Q. I mean going out into the interior of Texas anywhere from '65 to '66.

A. In 1865 I went to San Antonio and there married, and went to Monterey, Mexico; went through Piedras Negras, Eagle Pass,
724 and remained there a while, and returned by the same road to San Antonio.

Q. Do you know anything about a drought having occurred in that section of country in past years?

A. No; only I know of the great drought that has been around Laredo—in that vicinity for about twelve or fifteen years, thirteen years. They have had a great drought all through that section.

Q. Do you know how extensive that territory embraces?

A. Generally up and down the Rio Grande. I think clear to the

mouth, from information and my own personal knowledge, from what I have read in the papers, generally understood that it has been very dry.

Q. Did that drought extend above Laredo?

A. Oh, yes; all through above Laredo that has been a great complaint—about the drought. Everybody shipped all the cattle out of the country to Indian Territory to prevent them dying. All claimed that they had to ship them out. I guess they shipped 150,000 head of cattle to Kansas. I know this, because they came through Laredo.

Q. Over what scope of country did you personally observe that drought during any part of this period?

A. I was located at Aguilares. My travels were from Laredo to Aguilares during the extreme drought. I came home about once in every ten days or a week.

Q. What particularly called your attention to that drought and its effects, if anything?

A. In the first place, I opened a little place of business at Aguilares, and the people had had a hard year or two before that; and before that it had been quite dry, and they were all in hard and strained circumstances. I moved there in March, 1885, and that year it was very dry until May—about May. We had a very even season in that year, and up to '86. After that it dropped off, and absolutely nothing was rained in that section of the country. It became so that by charity weekly rations

725 were distributed out of the stores to keep the people from starving.

Q. Is that drought still continued?

A. Yes, sir; it is still on, as far as I know—still on.

Q. What effect, if any, did it have upon the running waters of that section of the country?

A. All more or less on running waters. Didn't have any water even in the ground wells that formerly had had plenty of water. They all became exhausted. I know that near the Galloway (?) ranch, which formerly had lots of water, where we all got our supply from, it got down so that there was a scramble for water. People would go there in the night time to get a bucket of water. They got permission from the superintendent of the railroad to get water off of the train.

Q. What place was that?

A. Aguilares depot.

Q. How far is that from the Rio Grande?

A. I suppose about thirty miles.

Q. Have you any personal knowledge of any streams in that section of the country which formerly were running streams and which have now ceased to exist?

A. I can't say that I do. I remember when I was quite small, ran away from home, crossing the Arkansas and Meridian and streams that emptied into the Arkansas.

Q. What section of the country are they in?

A. They are down next to the coast.

Q. Do you know a stream called the Padinas?

A. Yes, sir.

Q. Where does that empty into?

A. Into the San Antonio River. I have known that stream when it

used to be a brisk-running stream. I have lived in San Antonio a good deal.

Q. In what section of the country is that?

A. Near San Antonio, in Bexar County. It is about twelve miles from San Antonio, on the road from Laredo to San Antonio, on the railroad.

726 Q. What was the size of the stream when you knew it as a brisk-running stream?

Mr. CHILDERS. Is that a tributary of the Rio Grande?

A. A friend of mine used to go out there fishing and always told me about the large catch of fish he had made in the Medina, some twelve or fifteen miles from San Antonio. I don't know of my own personal knowledge.

Mr. CHILDERS. We object to that. It is hearsay.

Q. Do you know, from general repute in that section of the country, what has been the history of running streams over any considerable section or within recent years—whether they have been dried up or not—either in Mexico or in the United States and in that same general section of the country in which the Rio Grande is situated?

Mr. CHILDERS. We object to the general repute as not competent.

Mr. HAWKINS. I will change the question. Do you know of any streams which are now dry which, by general repute, were formerly running streams?

Mr. CHILDERS. We make the same objection to it.

The COURT. Objection overruled.

(To which action of the court in overruling said objection the plaintiff, by its counsel, then and there excepted.)

Q. In that particular section of the country?

A. Not in that particular section; no.

Judge FALL. That is, on either the American or Mexican side of the river?

A. I know from my own personal experience that the Salado River, that runs between the Monterey (?) and Laredo, in former years—I crossed it thirty years ago or more—was a brisk-running stream, and I have crossed it in going to Monterey—it was in standing pools. That is in Mexico, on that side of the river.

727 Q. Did you have any dry arroyos called to your attention by anyone pretending to know their ancient history as to their flow of water?

A. Yes; I know of a number of streams.

Mr. CHILDERS. I object to that question, as it calls for hearsay and is leading.

The COURT. The district within which these streams lie is not called to the attention of the witness. It is a preliminary question. It is immaterial which way it is answered.

A. Well, in coming from Piedras Negras to Eagle Pass and San Antonio I came by the mail road in 1867—

The COURT. That is no answer to the question.

A. Yes, sir; my attention was called to brisk-running streams in former years which are now dry.

The COURT. The answer to this question is yes or no.

Q. What particular arroyos did you have your attention called to by any person at any time in that general vicinity?

A. I don't know the names of the streams, the dry arroyos that I have passed over. That is, the carrier that was carrying the mail in those days would remark about it and point them out and tell about them.

Mr. CHILDERS. I object to it as hearsay. This witness is asked to say what he has been told by some mail carrier.

The COURT. It is competent to establish a historical fact by pure hearsay.

Q. When was that that you had your attention called to such dry arroyos?

A. In 1867—June.

Q. In what section of the country?

A. Eagle Pass and San Antonio.

Q. How many dry arroyos did you have your attention called to?

A. Two or three, I suppose—several that we passed over. I don't know now.

728 Q. Now, what was the appearance of these arroyos as to their ever having carried water?

A. They had evidently all been formerly running streams.

Q. Did you observe that from looking at them?

A. Yes, sir; and high banks and sand washed out.

Q. Did you talk with anyone about them and about their former character?

A. Never did, only as we passed them. Probably as I have passed over them since, might have mentioned it, perhaps.

Q. Did you at that time?

A. I have spoken about them.

Q. I mean about that trip.

A. Only him; that is all.

Q. What did he say with reference to their former history as running or dry?

Mr. CHILDERS. I object to that.

Mr. HAWKINS. We will withdraw the question for the purpose of going ahead and getting through.

Q. Where were you in May and June, 1897?

A. I was at , thirty miles from Laredo, in 1897.

Q. Did you in your duties at that bridge take note of the extraordinary rises and falls in the river since you have been stationed there?

A. Yes, sir; there has only been one extraordinary rise, and that was the 17th of June, this year, 1899.

Q. It was an extraordinary rise?

A. The highest since the early fifties, as the oldest inhabitants say so.

Q. Do you know where it came from?

A. Yes, sir; that rise, I know where it came from—at Los Moras, above Eagle Pass, as we had telegrams from Eagle Pass telling us to look out for the bridge.

Q. Did that rise, or any other rise, affect the safety of the bridge since you have been there?

A. No, sir; that rise didn't affect the bridge at all.

729 Q. Has the bridge been affected by any rise since you have been there?

A. No, sir; not since I have been there.

Q. Has that bridge been taken out in part by any rise that you know of?

A. There was a small rise before this one, from what men say that were located—stationed—on the bridge.

Mr. CHILDERS. We object to hearsay of any kind.

Q. Did you see the bridge in a crippled or impaired condition at any time?

A. No, sir; I didn't. I was at Aguilares.

And now, at this hour of 10 o'clock p. m., an adjournment of the hearing of this cause is taken until to-morrow morning, the 15th day of December, at 9.30 a. m.

And now, at this hour of 9.30 o'clock a. m. of the 15th of December, 1899, pursuant to adjournment, the further hearing of this cause is proceeded with.

Present as before.

OLIVER T. REED, direct examination (continued):

By Mr. HAWKINS. I wish to ask one more question.

Q. From your knowledge of the Rio Grande River, as testified by you in this case, would the construction of a reservoir 125 miles above El Paso, Texas, and the impounding in that reservoir of all the waters of the stream, and the use thereof for the purpose of irrigation at that point in the valley of the Rio Grande, have any effect upon the navigable capacity of the river from Rio Grande City, Texas, down its course?

A. My opinion is that it would not.

Cross-examination:

Examined by Mr. CHILDERS. You say, from your knowledge of the river, the impounding and taking out of all the waters of the river, 125 miles above El Paso, would not in any way affect the navigability of the river from Rio Grande City to the Gulf?

A. I don't believe it would.

Q. That is merely your opinion?

A. Yes, based on the fact that the long channels that it would have to go through, and it would naturally play out, get short; that has been my knowledge of the arroyos in the upper river.

Q. Do you know how far it is from Rio Grande City to El Paso?

A. I couldn't tell you.

Q. You don't know how far it is? Do you if the water ever reaches Rio Grande City, coming from El Paso?

A. I can not tell you.

Q. You don't know whether it does or not?

A. I do not.

Q. You don't undertake to say what portion of the water that passes a point 125 miles above El Paso would pass Rio Grande?

A. I don't know.

Q. Don't you know whether ninety, ninety-five, or a hundred per cent?

A. I simply gave my opinion.

Q. You are not an expert?

A. No, sir.

Q. You have not made any scientific investigation of that at all?

A. I am not versed at all in matters of that kind.

Q. I understood you to say you lived at El Paso in 1864?

A. I lived there in '64.

731 Q. You went there in 1857?

A. Yes.

Q. And lived there from '57 to '64?

A. Yes, sir.

Q. You left there in '64 and went to—where?

A. Went to Presidio del Norte first.

Q. How long did you stay there?

A. Some days, and my friends got into trouble, and went to Chihuahua to get them out.

Q. You were on your way to Louisiana to join the army?

A. That was long after that.

Q. You stopped over a few days in Presidio del Norte?

A. Only a few days.

Q. How long did you stay in Chihuahua?

A. Stayed in Chihuahua about six weeks, and returned and stayed a few days and went on down to Piedras Negras. Stayed there several months.

Q. From there where did you go?

A. To San Antonio.

Q. Lived there some time?

A. Yes, sir.

Q. From San Antonio, where did you go?

A. Went back to Monterey, Mexico, then near Victoria, and stayed there some time.

Q. I don't care about asking you every place you went to. When did you come back to the river to take up your permanent residence? When did you go back after leaving El Paso in 1864?

A. Came back to Mexico in 1866.

Q. Where did you settle next on the river?

A. Didn't settle on the river at all. When I came back, went through first in 1867 to the Nuecas River, remained a year, and then went back to Rockport.

Q. Is Rockport on the river?

A. Went to Rockport, and remained there seven years.

732 Q. Then did you ever return to El Paso to reside?

A. Never have.

Q. What other point on the river did you at any time thereafter return to, to reside?

A. Came to Laredo in '77, January, 1877, and that has been my permanent home ever since.

Q. From 1864, when you left El Paso, up to 1877, you didn't reside on the river?

A. No, sir; I did not.

Q. How old did you say you were?

A. 62 years of age.

Q. What is your business?

A. I am a collector of the international bridge at Laredo, Texas.

Q. What business were you engaged in before you occupied your present position?

A. Merchandising for 28 years.

Q. Was that a general merchandise business or a saloon business?

A. General merchandise. Had a saloon in 1868 for two years, and after that I was in the wholesale liquor and cigar business, and after that I was in a flour business for some years in Laredo—about seven years, and after that in general merchandise, and up to October, 1897, when I quit, was taken sick, and gave up the business.

Q. Now, you said something about the drought of 1893 and 1894. When did that drought begin?

A. The drought has been on since 1884 and 1885. We had only two good years after that.

Q. When did you have the two good years?

A. In 1885 had a good year, and 1886 a good year. I know I bought a good deal of corn in 1886.

Q. How was that corn raised?

A. By rainfall.

Q. No irrigation?

A. None, whatever—that is, below Laredo, thirty miles. I lived on my ranch, but had a place of business thirty miles below.

733 Q. You say that drought has continued ever since then?

A. With the exception of the two years that I have mentioned, to a greater or less extent.

Q. Didn't have any good years since then?

A. Don't think there has been any.

Q. Continued to be a good cattle country up to that?

A. Cattle all died off along; a great many died in 1884 and some died in 1890 and 1891.

Q. And practically the cattle business was abandoned, or in process of abandonment from 1884 on?

A. The old residents there for thirty-five or forty years had formerly had good luck with their stock, but then the business began to go down; there was no money in it.

Q. You said something about the cattle being sold in 1893 and 1894; don't you know that there has been a pretty general sale of cattle in 1895 on account of the increase in price?

A. Don't remember anything about that.

Q. Isn't that a fact?

A. Don't know.

Q. Don't you know when the cattle was sold out of this section, and through here, Colorado, Arizona, as well as New Mexico, large, heavy sales took place in 1893 and 1894, on account of cattle being good, partly on account of the rise which took place in 1895?

A. Don't know anything about the cattle business.

Q. Don't you know that there is still in that immediate section of country, about which has been testified, a large cattle interest between Laredo and Corpus Christi at present—large numbers of cattle?

A. Don't know that it is below. Some sixty miles from Rio Grande I know there is only two or three parties that own any cattle of any
734 consequence—Mr. Browning and Curtis that own any quantity.

Q. No large cattle owners?

A. Only two others. Cuthbertson, of Laredo, and Garza Brothers, of Los Juales. They are the only ones I know of owning any amount in that section.

Q. You said something about getting a bucket of water out of well; it all dried up?

A. Been exhausted to water the stock.

Q. Where was that?

A. At Aguilares, where I lived; where I had a store.

Q. Know anything about a spring that has been there?

A. No spring there at all.

Q. That runs continuously?

A. No spring there; that is a place nine miles from there. It used to run right brisk; now no water—choked up and don't run.

Q. How far is that spring from the river?

A. About twenty miles.

Q. You say that is choked up and don't run the way it used to?

A. No, sir; it supplied an abundance of water for consumption of the inhabitants.

Q. I asked you to look at this stretch of country, including Laredo [referring to large land-office map hanging on wall], Corpus Christi, and Brownsville down there, that triangle there included in those points, along the river from Laredo to Brownsville. Don't you know that that stretch of country to-day is grazing on it nearly a million head of cattle?

A. No, sir; I don't know.

Q. How many did you say are grazing on it?

A. Don't know.

Q. Half a million?

A. Don't know.

Q. Hundred thousand?

A. Don't know.

735 Q. Don't you know that it is generally considered that stretch of country, and the cattle ranges on that stretch of country, are considered the best cattle ranges in the United States?

A. Along the river?

Q. In the triangle.

A. There are some good cattle ranches that I have formerly known, many years ago. Don't know anything of late years because I haven't been there, but there has always been something—75 to 80 miles there always been good ranges.

Q. From what points? From Rio Grande City or Brownsville?

A. East.

Q. 75 miles north and east?

A. What you might say east or northeast. Don't know anything about the lower Rio Grande because I never was there and can't give you any information about it at all.

Q. You commence with Laredo; that is where you have been living?

A. Yes, sir; Laredo, I know about.

Q. Did you hear the testimony of Doctor Hadley?

A. Heard a part of it.

Q. About the number of cattle and the cattle ranges there?

A. Yes, sir.

Q. Did you hear the questions asked him?

A. I heard those questions.

Q. What have you to say about that?

A. Absolutely no information about them; not acquainted with those points at all.

Q. You heard his testimony about that scope of country, 500 by 600 miles, as to the condition of it since 1888; what is your knowledge on that subject?

A. I should judge that it was about 250 by about 600; that would be my estimate of the drought portion.

Q. You describe it in the same way but reduce the area?

736 A. Yes, sir.

Q. Never been over it?

A. Never been on the lower Rio Grande, except Roma. That is the only place I have been on the river.

Q. Been above Roma in late years?

A. Was there in 1876, and never been above or below it.

Q. Spent your whole time at Laredo and vicinity?

A. Yes, sir; and in vicinity.

Mr. CHILDERS. That is all.

Dr. THOMAS J. TURPIN, another witness on behalf of the defendants, being called, and being duly sworn to testify the truth, the whole truth, etc., on being questioned by Judge A. B. Fall, testified as follows, on direct examination:

Judge FALL. Please state your name, residence, occupation, and age.

A. My name is Thomas J. Turpin. My residence is El Paso, Texas; it has been only there for the last few weeks; formerly it was in Laredo, and lately in the city of Mexico on Government service. My profession is physician and surgeon, and my age is fifty-one years.

Q. Where did you live from 1871 to the year 1889?

A. Chiefly in Corpus Christi. I made several trips to Kentucky in that time, and on one occasion—from 1875 to 1878—I lived out of the State of Texas—in Kentucky, I think.

737 Q. In the year '89, where did you live?

A. In Laredo, Texas, until the spring of '90, when I went to the City of Mexico—'99 I mean.

Q. From 1889 to 1899 you lived in Laredo?

A. Yes, sir.

Q. That is on what river?

A. On the Rio Grande River.

Q. What was the condition of the country in and around Laredo, of which you had knowledge, between the years 1889 and 1899, as to rain-fall or drought, if you know?

A. Nearly all these years, from 1889 to 1899, were drought years—more than usually dry. There were, of course, rains occasionally, sometimes very hard rains, but they were much dryer years, all of them, than the preceding years that I have known of in that section of Texas.

Q. What was the effect of the extraordinary dryness, or the drought of those years, upon the country, inhabitants, and the cattle and stock interest, if you know?

A. The country was dry; the wells were, many of them, dried up or lessened in volume of water. The people on the border below Laredo and, to some extent, above Laredo were poor. The cattle died, the grass was short all the time, or most of the time, and many times there was no grass. Much of that—almost all of that time—there was no grass at all along the river.

Q. What was the effect of this drought, if you know, upon the streams tributary to the Rio Grande and the other streams in that section of the country?

A. Well, there are no other streams that are permanent in that particular section of the country that I knew of. My knowledge of the Rio Grande extends from Carrizo, Texas, to perhaps eight or ten miles above the town of Laredo, a distance of about 75 miles.

Q. Then you only know the effect of the drought so far as the water there was concerned. As to the wells—

738 A. That is all, and knowing that there was no rains.

Q. That was the effect of this drought, if any, so far as you have stated—that the people became impoverished, or were poorer; what was the effect, ultimate effect, as to their condition?

A. A great many of the people moved away; many of them were so poor that they lived on charity. In Laredo there were several times—nearly every year—four or five times at any rate, that I know of, in that ten years there were collections taken up, and money and food sent to them. That is, below the town and above, but the people down the river mostly.

Q. Do you know of any other points at which subscriptions were had for charity, besides Laredo?

A. Yes, sir; collections were made in many parts of the State that I know of, especially in Corpus Christi and San Antonio. I knew of these personally, to some extent, and I know from hearsay of others that in other parts of the State collections were made and large quantities of food and other supplies sent to the people in that neighborhood.

Q. What, if you know, has been the average difference in the flow of the water in the Rio Grande at Laredo during the last ten years; that is, from 1889 to 1899?

A. I think it has gradually decreased, though the difference has been very hard to determine, because there was always variations from week to week and month to month that were hard to tell about.

Q. What is the longest period, during this drought period which you have mentioned, from 1889 to 1899, that you can recall, when you had little or no rain?

A. There was one time of about eighteen months when there was almost no rain. I think in all about three rains of any consequence. I think I might go further than that, and that there were not more than three or four rains in all that length of time.

739 Q. During that eighteen months?

A. Yes, sir.

Q. Do you know anything about any floods in the Rio Grande River reaching Laredo during the year 1897?

A. Yes, sir; my attention was particularly called to that, because all kinds of rises, in the floods in the river above, and because of the settling of the bridge pier in 1897.

Q. The bridge pier; what bridge pier?

A. The bridge pier on the foot bridge—the International Bridge at Laredo.

Q. At Laredo?

A. At Laredo.

Q. Between the town of Laredo and Nuevo Laredo?

A. Yes, sir.

Q. What was the cause, if you know, of the settling of this bridge pier?

A. There was a rise in the river at that time—not a very great matter.

Q. What time of the year was that?

A. In the spring, some time between the first of May and the last of June. I think about the first of June.

Mr. CHILDERS. What year was that?

A. 1897. The rise at that time was not nearly as great as I have seen before and as I have seen since that. It was, I should judge, only 6 to 8 feet over the ordinary height of the river.

Q. Do you know where that rise came from?

A. I believe it came from the Pecos and the Devils River, and possibly from higher up.

Q. What reason did you have to believe that it came from the Pecos and Devils River, and possibly higher up?

A. There were accounts of heavy rains, telegrams to that effect, and rises in the river at that time there and about the same time at El Paso. It was a matter of common conversation that the rise from El Paso could not have had time to get down there in time to account for the rise at Laredo.

740 Q. Now, with reference to this rise at El Paso, did you have any reason to watch for that rise?

A. Yes, sir; the special reason was that it was the condition of the bridge. It was supposed that if we had the predicted rise, coming upon the top of the one that was already there at the time of the settling of this bridge pier, that the bridge would be swept away; and my attention and that of every other citizen nearly, was called to it—to the effect of the rise in El Paso, as well as from our interest in El Paso.

Q. Did that rise from El Paso ever materialize at Laredo?

A. No, sir; there was no material rise before any possible rise could have reached Laredo from the El Paso district. The river had receded to some extent—two or three feet—I don't know how much, but the danger was practically over for the bridge; and although it had been predicted that there would be a very material raise again there was none of any consequence.

Q. How many times a week or a month or a day, if at all, did your business compel you to cross this bridge which you speak of?

A. I was for over eight years quarantine officer at Laredo. It was my duty to meet every train coming in from Mexico. I met two trains a day always—regularly every day, except once in a while a short interruption when sick, when I happened to be sick. Every day for those eight years I made at least two trips across the river for that purpose. I very often made two, three, or four trips across the river on my professional business to New Laredo on the short bridge.

Q. By what means did you cross the river?

A. I crossed on the railroad bridge on the train going south to meet the train coming north twice a day. The other times I crossed in my buggy on the other bridge.

Q. Where did you say you have resided, Doctor, since you left Laredo this year?

741 A. I went the last of June to the City of Mexico, and returned to Laredo in the last of November.

Q. What was your business in the City of Mexico?

A. I was acting assistant surgeon in the Marine-Hospital Service.

Q. In what service?

A. In the Marine-Hospital Service of the United States, on duty in Mexico with reference to the quarantine.

Q. When did you return from Mexico, and to what point?

A. I came from the City of Mexico on the 15th of November to Laredo, Texas, arriving there on the 17th. I remained there for a few days and went to Corpus Christi on a flying trip of four or five days, and then came back to Laredo, and further on came to El Paso via San Antonio.

Q. Upon your return to Mexico from Laredo, and afterwards your return from this flying trip to Corpus Christi to Laredo, did you notice the condition of the Rio Grande at Laredo?

A. Yes, sir.

Q. Was there or not the usual flow of water in the Rio Grande at Laredo?

A. About. There is, as I stated before, I think, a gradual diminution in the past ten years.

Q. When you reached El Paso from Laredo what did you notice as to the condition of the Rio Grande?

A. It was dry; that was, I think, the second time I saw it. There was a little water in spots in the bed of the river, but it was dry entirely when I saw it a few days ago.

Q. Since 1897, this flood which you speak of, which settled the bridge pier, or which affected the bridge pier in Laredo in 1897, have you seen any other floods in the Rio Grande at Laredo?

A. Yes, sir; there was a flood in the fall of 1897, not so much, I think, as that of the spring. There was a kind of a flood in the spring, and in the fall of 1898 there was a flood—

Q. How did these floods in 1898 compare with the flood of 1897 at Laredo?

A. The flood of 1898 was greater than that of 1897.

742 Q. And the spring to the fall one?

A. Both of them, I think, were greater than that of 1897. The flood of 1899 was also very much greater. The flood of 1899, in the spring, was the greatest that I have seen in Laredo, I think, at all. Yes; I know.

Q. What time in this year was that flood?

A. That was in the spring, along in May or early in June, because I left Laredo late in June.

Q. Do you know, or did you have any reason to know, where this flood of 1899 came from—the spring of 1899?

A. I understood it came from the cloud-bursts at Brackett. There was, that time, cloud-bursts at Brackett—in that vicinity.

Q. Where is Brackett, Doctor?

A. It lies to the north. I think it is somewhere near the railroad, or in the neighborhood of Spoffords Junction, above Laredo, and a little back from the Rio Grande River—a few miles.

Q. Do you know where the floods of 1898, which you have referred to came from?

A. I have reason to believe that they came from the same neighborhood, or rather from the Pecos and Devils River.

Judge FALL. That is all.

Cross-examination:

Questioned by Judge BURCH. Where do you live now, Doctor?

A. I live in El Paso. I have just opened an office there within the past ten days, so that I may say that I live there, although I haven't been there very long.

Q. You haven't been much accustomed to testify in courts of law, have you?

A. Yes, sir; you might say—testified in medical cases, however.

Q. Have you generally, when you have been accustomed to testify, testified to what other people told you, or what you heard of in a locality; has that been your custom; for instance, in this last matter
743 that you have reason to believe so and so—matters outside of your own knowledge? Have you really been accustomed to volunteer such testimony as that, and tell what you have been accustomed to hearing?

A. My chief testimonies—

Q. Never mind about that; tell me what your custom has been?

A. To tell as to my knowledge and belief, and chiefly on technical points.

Q. Your professional opinion?

A. My professional opinion.

Q. You may be excused for getting outside of that in other cases.

Judge FALL. We object to this method of undertaking to cross-examine a witness.

The COURT. Proceed.

Q. Doctor, previous to 1889, was it, you went to Laredo?

A. Yes, sir.

Q. Did I understand that you had resided along the Rio Grande at any time before?

A. No; I never lived on the Rio Grande. I had made occasional visits there from Corpus Christi.

Q. To what points?

A. The neighborhood of Laredo and Carrizo.

Q. How often had you been there?

A. From what dates do you mean? I went to Laredo in 1872.

Q. How many times?

A. Once. I went to Laredo again some eight, ten, may be twelve times between 1872 and 1889.

Q. Ten or twelve times?

A. Ten or twelve times, all the way to Laredo, and frequently half way.

Q. Then you were living down on the Gulf?

A. Until 1899.

Q. I suppose, as a professional man, you understand, and from common observation you understand, that there are dry seasons and wet seasons in nearly every locality in the country, don't you?

A. Yes, sir.

744 Q. You understand, from your common observations of life, there are times when calamities overtake every neighborhood, when they call upon charity for subscriptions?

A. Have seen frequent occasions of that sort.

Q. Have read of them, also, frequently?

A. Yes, sir.

Q. From the time when the brethren of Joseph went down into Egypt after corn, you have heard of that?

A. Yes, sir.

Q. Was that a common condition of affairs that existed over every other portion of the country, so far as you know, in that immediate locality?

A. Yes, sir.

Q. During those years?

A. My experience of Texas, as I have stated, extended from 1871 to the present time.

Q. But you were in the humid climate, down near the Gulf, where there was a great precipitation and rainfall?

A. Greater precipitation than further up. The further up you get from the bay the dryer it becomes.

Q. Largely, that has always been so, at least as far as your recollection extends?

A. Yes, sir.

Q. Dry up in the interior and humid down near the Gulf?

A. Yes, sir.

Q. Great precipitation; heavy rains down there—

Judge FALL. We don't think that is a proper way to get at those things.

The COURT. Make your objections to the court when you have any to make.

Judge FALL. The gentleman seems to testify himself, without letting the witness say what he wants to say.

Q. Now, Doctor, you didn't live up in that vicinity during the years—the ten years previous to the time when you moved there?

A. No, sir.

Q. Then, how is it that you say that this was an unusual condition of things during the ten years when you did live there?

745 A. The ten years that I lived there were certainly dryer than any other period in the past twenty-five or thirty years in that locality, because—may I give my reason?—because, previous to that time I had known that there were—that there was immense herds of cattle on the river. It is true that I didn't count the cattle, but I know that there were immense herds of cattle there, because many of these

cattle were shipped in and out on the railroads. For example, when I came to Laredo there were herds of cattle shipped out that were so poor—I saw them when they were putting them in the cars—that they couldn't hardly stand up for want of food and water. They were shipped out because of that, as I understand from talking with the men who had charge of them. They were shipped away from there because of the drought. These cattle were in such a condition that they plainly verified the statements that I heard from the people there.

Q. Before this time, of the eighteen months, was that?

A. All these ten years, more or all.

Q. All the while?

A. More or less. Some years the drought was greater; other years it was not so great. Some years the most that they shipped was the bones of the cattle. There were hundreds and thousands of carts loads of bones brought to Laredo from that portion of the country, down the river—and up the river to some extent.

Q. Now, are you through with your explanation? Now, did you mean to say, Doctor—and that is what I want to find out—that the average rainfall over that ten years was less than the average rainfall for the previous ten years, from 1879 to 1889?

A. Yes, sir.

Q. How do you know that; did you keep any record of the precipitation in that vicinity—at Laredo? I am not talking of Corpus Christi. You had ten years' previous experience in Corpus Christi, where it is humid, and all that. Now, I want to know about Laredo and its vicinity. Tell me, if you can, what the average rainfall was for the ten years prior to that, compared with that ten years; that is what I want to know.

A. I can't tell you. Don't know the average rainfall for the ten years previous to the ten years spoken of.

746 Q. Can you give me the average rainfall for the ten years spoken of?

A. I can tell you this——

Q. Never mind; answer my question. It may be answered "Yes" or "No."

The COURT. You may answer the question yes or no, and then make any explanation you see fit.

Q. Can you tell me that?

A. No, sir.

Q. Now, do you wish to make any explanation?

A. I wish to say that I have a general knowledge of the rainfall for the past twenty years along the Rio Grande, from an examination of the Government reports at Fort McIntosh. I did not make this examination with a view to testifying, but for my own satisfaction.

Q. Where is Fort McIntosh?

A. It is at Laredo.

Q. Never mind; go on with your explanation.

A. I didn't make them with a view of testifying, but for my own satisfaction. I satisfied myself—I was satisfied in my own mind that there was less precipitation on the Rio Grande, and that portion of the Rio Grande, in the past ten years, however, compared with the previous ten years, or previous twenty-five years.

Q. Now, will you just tell me what that general examination was; will you report it here?

A. I frequently talked with the observer in charge and with the doctor at the post.

Q. Oh, but I thought you examined the records?

A. I did. I frequently talked with them and examined their record in the course of my visits to the hospital at Fort McIntosh. I was at one time temporary surgeon in charge at Fort McIntosh, and frequently had conversations with the steward and with other persons who had charge of that record there, and while, as I say, I did not make any record of it—of the precipitation for any particular year—I compared the records there from time to time with the previous records, and satisfied myself that the rainfall was less of later years than it had been previously.

Q. Now, Doctor, you are giving, if I understand, what you are satisfied of. What I want to know is, what you got it from?

A. I got it from the records.

Q. I want to see if I can be satisfied, just the same as you are.

A. I got it from the records.

Q. Now, tell me what you got; not how you got it, but what you got. If you are satisfied, I want to know what you are satisfied from. Tell me the information that you got.

A. I got the information that the rainfall was less *than* in the past ten years than it was in the previous ten years.

Q. And if you got it from that information, just tell us that information.

A. I have stated that I got the information that the precipitation was less, that the rainfall was less, in the last ten years than before. I have not a recollection now of the definite number of inches in each month or year or any part of that time. I didn't get it for the purpose of testifying; I got it for my own satisfaction.

Q. But you knew you were coming here to testify?

A. No, sir; not at that time.

Q. You have testified about the effect of this information upon your mind. Why shouldn't you have brought the records?

A. I never heard of this case until I got to El Paso—within the past ten days.

Q. That is a good excuse. Now, then, your information during that length of time—that is, your circle of travel was very limited, was it not? You never left that place during the eight long years that you lived at Laredo; was on and off the trains every day for eight long years, except a day or two when you were sick?

A. I traveled up and down the river and out into the country in the pursuit of my profession, and on hunting trips from a distance of about—well, extending from Carrizo down the river to ten miles above Laredo. Sixty miles or so around Laredo.

Q. Sixty miles would comprise your acquaintance?

748 A. Sixty miles around Laredo, except occasional trips to Corpus Christi over the railroad.

Q. That didn't prevent your going across the bridge for the eight years when you were sick?

A. That was my usual duties there.

Q. That is, you went to the Texas end of the bridge and looked after the train and ran across the bridge?

A. Yes, sir.

Q. Now, at that same time the river was decreasing in its flow, wasn't it, year by year, from 1889 down to 1899?

A. Yes; from 1889 down to 1899.

Q. There was a gradual decrease in the river, you say?

A. I think so.

Q. That is what you think; that is a part of our theory. Now, did you connect that six miles experience around there with that decrease in the river, did you believe that that decrease in the river from year to year was owing to your sixty miles experience around there?

A. Why, no, sir.

Q. Did you believe it was owing to the streams drying up that were—before this had been tributary to the Rio Grande? Was that your belief, that it was decreasing because these streams were decreasing just above you?

A. I think so; yes, sir; that was my impression.

Q. It could not have occurred from any cause above these streams that you knew, or just in that vicinity?

A. I don't know; I haven't any opinion.

Q. Haven't you expressed that belief here?

A. What belief?

Q. On the witness stand.

A. Judge FALL. I object.

Q. Have you expressed here substantially—I mean in substance and effect—in your testimony and evidence, have you not expressed the belief here that the rises in this stream occurred from causes immediately in the vicinity of Laredo, or just above, from branch streams? Haven't you intended to imply that?

749 A. My record is there; read it.

Q. Your record is there, but I ask you the substance and effect of your testimony that you have offered to the court?

A. No, sir.

Q. It isn't. Now we will go the flood of '97, and let's see. Didn't you say that when that flood came you had reports from the Pecos and Concho, and the Devils River, immediately, or not far above Laredo, which dealt with the flood that occurred there? Didn't you say that?

A. That is in the record.

The COURT: Answer the question.

A. Yes; I did. Not that I had reports, but that I saw reports.

Q. That is the same thing. You became aware of those reports and you waited for the rise that might engulf the bridge, you said?

A. I spoke of—

Q. You were looking for it, you expected that rise, but that threatened rise didn't come?

A. That was my testimony.

Q. But didn't the flow keep up a long while after that time, not so as to engulf the bridge, but didn't that flood keep up a long time?

A. For a long time.

Q. Yes; at that point.

A. No, sir; as I testified, the flood at that time was not a very high one at any time.

Q. No; but didn't the high water keep up for a long time after that?

A. I think not longer than the ordinary floods. Floods ordinarily keep up a few days at Laredo.

Q. Will you state how long after that flood began it ceased, and the river went down to normal conditions, or low-water mark?

A. No, sir; I can't state.

750 Q. Don't you know that it went until nearly the last of June?

A. That is the flood you speak of—1897?

Q. The first flood of 1897; don't you know that at Laredo it ran until nearly the last day of June?

A. No, sir; I had no reason to take particular notice of the length of time and I only noticed it a few days while the bridge was endangered.

Q. Will you state that it did not keep up to late in June or early in July at a good high stage there; you desire to be so understood?

A. I will state this, that—

Q. Now, will you please answer my question?

The COURT. Just answer the question, and then you may make any explanation you see fit.

Q. I only want to know if you desire to be understood that that flood didn't keep up to the last of June or July at a high stage?

A. I do not remember.

Q. Now, Doctor, you are positive that there was a constant diminution of the waters of the stream from 1889 to 1899?

A. Oh, no; I didn't state so.

Q. On the average?

A. I said that it was a very hard thing to estimate; that I thought my impression was that there had been a gradual diminution in the flow of water there for the past ten years.

Q. You feel very positive of that, don't you?

A. No; I don't feel very positive.

Q. Why not?

A. Because one year you may have a river very low, or on a certain date in December, and the next year it may be higher on account of various things that I don't know anything about. There may be a flood one day and a very low stage of water another month, and it's mighty hard, unless one keeps a tally every day, to determine that point. The average man who looks at the river can't even tell from day to day whether it is going up or down a few inches or even a foot, and when he has to
751 depend upon his recollection from year to year, why it is very hard.

Q. Are you that average man?

A. I think I am more than the average man.

Q. Now, are you an average man in the point of observation, such as you have been describing?

A. I think I am more accurate than the average man in such matters.

Q. Well, now, if you are more accurate than the average man, from what does your accuracy arise, measurements? Why should you be more accurate than the common Mexican who crosses that bridge, unless you measured it?

Judge FALL. I object to that; it is immaterial, absolutely immaterial. WITNESS. I would like to answer that question.

The COURT. This goes to the accuracy of the observation of the witness and is competent for that reason.

Q. Did you make any measurements?

A. I would like to answer the question just before that. I have been a student all my life; a professional man. I have been, therefore, more inclined to accuracy of every sort than the average Mexican. I have been more of a reader, more of a reader of newspapers, more of a reader of scientific books; had my interest, my attention called more to finding out of things than the average Mexican or average man because of my profession, because of my habit of study.

Q. Well, now, you pretend to say because you are more higher educated and learned and a cultured gentleman than perhaps the ordinary Mexican that you would be more accurate than the ordinary Mexican who is accustomed to look at that river every day and see it as much every day as you, and say, for instance, the boatman who crosses in a skiff every day, is that what you mean?

A. That is what I think.

Q. That is what I want to know. That is one of the things that the court is naturally expected to consider. Now, Doctor, you was an accurate observer of this river for ten years—close observer of it, you say; suppose a dam had been erected across the mouth of the river Pecos, which falls into the Rio Grande above, in such a way as to divert the entire waters of the Pecos, and suppose that another had been built across the mouth of the Concho—that comes in or falls in from the Mexican side above there, I believe—and each and every other stream between Laredo on the south and El Paso, so as to divert every foot of water, do you think the river would be rather dry at Laredo? I mean dry except for the precipitation and rainfall in that vicinity. Now, you are a close observer of everything, and a great reader, etc., I would like to have you answer us that question.

A. Explain to me what you mean by the word "divert."

Q. Cut off entirely, turn away from, keep out, turn away from the Rio Grande.

A. If the water had all been diverted from the channel of the Rio Grande—

Q. In every stream—

A. In every stream—

Q. Falling into it between Laredo and El Paso—

Mr. HAWKINS. Let the witness answer the question; you have asked the question.

Q. I want to know your opinion, Doctor, in regard to it?

A. A large portion of that water would return to the river.

Q. Oh, but that is assumed. I said divert, that means cut out.

A. If it were possible, which it is not—

Q. Never mind whether it is possible or not.

The COURT. You understand the question—the assumption is that the water is bodily diverted from the stream; now answer the question on that.

A. If the water were all diverted from the stream, and didn't get into

the stream, it wouldn't run in the stream, there would be no water there.

Q. True, very true. Now, Doctor, there is no use of my repeating the question, but we are here to stay. I want to know whether
753 it is your opinion the stream would run dry again, if these streams between it and El Paso, not above El Paso—when the main body of the stream was called, to use the streams that run in between Laredo and El Paso. Please answer my question.

A. You mean that if the streams between Laredo and El Paso, and not the streams up here?

Q. Yes, sir.

A. I don't know what volume of water comes from the Pecos and what from the head waters of the Rio Grande. I couldn't answer that.

Q. You can't answer it?

A. No.

Q. But you have answered somewhat similar. Will you give me the best of your opinion about that matter?

A. I think the more water that was diverted from the stream the less water there would be in it.

Q. Very true. Now, do you think if some of this water between these two points were diverted, there would be any left in it? If some of the water—I mean all the water coming into the river naturally between El Paso and Laredo—were diverted from it, whether the stream would run dry; I want your opinion.

MR. HAWKINS. If the court please, we want to object to the examination of this witness on the effect at Laredo of the diversion of waters at points above El Paso—points between El Paso and Laredo. This witness has not been asked one single question which bears upon that point at all, and it is not proper cross-examination.

(Objection overruled. To which action of the court in overruling the said objection the defendants by their counsel then and there excepted.)

Q. Doctor, maybe I might make you comprehend it in another way. You are a physician and surgeon, I believe. Now, suppose a man were to suffer a misfortune by which his right leg had to be amputated, it would decrease his power, I suppose you would say, wouldn't you; that is, naturally decrease his natural powers?

754 A. I don't know what you mean by that. You mean that he would have less strength in the arms, or less strength in the leg that was cut?

Q. Anything that you see fit.

A. A man would be as healthy and powerful, in the sense of life, with one leg as with two.

Q. His locomotion and natural power—

A. I don't understand that.

Q. His locomotion and natural power—would it decrease his natural power?

A. Yes.

Q. Suppose his right arm was taken off by some other accident; would that decrease his natural power?

A. Yes, sir.

Q. That would decrease his capacity, wouldn't it?

A. Yes, sir; capacity for locomotion and other means of making a living.

Q. Suppose, in addition, that his left arm was taken off, there would be a further decrease in his natural powers, wouldn't there?

A. Yes, sir.

Q. Now, would the answer be a dead man; might not that all occur and he still be a live man?

A. Yes, sir.

Q. Now, I will come back to the river. Suppose the waters of the Pecos should be diverted——

A. Yes, sir.

Q. Suppose the water of the Concho and every other stream between Laredo and El Paso should be diverted, would the stream run dry, in your opinion?

A. It would be dry when it is dry above.

Q. When it is wet above, would it be wet; would it naturally follow that it would be wet below?

A. No, not always; it would sink into the sand.

Q. Would it be likely to follow——

A. The less water there would be in the stream from all sources the less there would be at Laredo.

Q. Then the more water there would be the more water there would be down there?

A. Yes, sir.

Judge BURCH. That is all; take the witness.

Judge FALL. Thank you, sir.

H. K. WARE, another witness on behalf of the defendants, being produced, and being duly sworn to testify the truth, the whole truth, etc., on being examined by Judge A. B. Fall, said, on direct examination:

Questioned by Judge FALL: Will you please state your name, residence, and occupation?

A. My name is H. K. Ware; reside in Del Norte, Texas.

Q. Your occupation?

A. Real estate business.

Q. Will you point out on the map the place of your residence, Mr. Ware, so that the court can see it?

(Witness points out on map of United States location of Del Rio.)

Mr. HAWKINS. I would like to call the attention of the court to the fact that we are proceeding up the river with the witnesses.

Q. What is your age?

A. I will be fifty-six next birthday.

Q. How long have you lived in Del Rio?

A. Since the fall of 1881.

756 Q. On what river, if any, is Del Rio situated?

A. On the Rio Grande.

Q. Where did you live prior to going to Del Rio?

A. I lived in Comanche County; first place of residence in the State.

Q. Of Texas?

A. Yes, sir.

Q. Are you a native Texan?

A. No, sir.

Q. When did you first come to Texas?

A. In '70.

Q. To what point in Texas did you come?

A. Camden.

Q. How long did you live there?

A. Three or four years—five years, perhaps.

Q. What portion of the State is Camden?

A. It is almost the center of the State, I should suppose.

Q. And where did you go to from Camden?

A. I lived some time at Fort McKavett.

Q. What portion of the State is Fort McKavett?

A. In the southwestern part.

Q. And where did you go to from Fort McKavett?

A. Fort Clark.

Q. What part of the State is Fort Clark?

A. Southwestern part.

Q. When did you leave Fort Clark, and where did you go?

A. Left Fort Clark in fall of 1881 and went to Del Rio.

Q. And have lived, as I understand, at Del Rio since that time?

A. Yes, sir.

Q. When did you first know the Rio Grande?

A. In '79, I believe it was.

Q. Where was that?

A. Eagle Pass.

Q. How far up or down have you known the Rio Grande?

A. Well, I have been on the Rio Grande from this point to Laredo—
not over the whole length of it—at different points; I have been on the
Rio Grande at different points between here and Laredo.

757 Q. Do you know any of the tributaries of the Rio Grande in
the State of Texas, or from the Republic of Mexico?

A. I do.

Q. Can you mention any of those tributaries which you know?

A. I can.

Q. Will you do so, please?

A. The first tributary of any consequence above Eagle Pass is known
as Elm Creek.

Q. What is the size of that creek, bed, and the character of it?

A. Well, sixteen or eighteen years ago it used to be a continuous running stream, about as wide as this room is long, generally that wide (about forty feet), within eight or ten miles of the mouth of it. It is now—the banks are fully as wide and deep—and stands in pools. It is running now, this year—the first time in years, though.

Q. What is the cause, if you know, of the diminution of the water in the Elm Creek?

A. Scarcity of rain for the last fifteen years.

Q. Is there any irrigation around or in Elm Creek?

A. I don't think there is any.

Q. Is there, or not, any water diverted from this creek, or taken out by artificial means?

A. Well, the railroad at the crossing, having a water tank there. I am not positive whether they have got it now or not.

Q. Is that the only method by which ordinary water is drawn from this creek, that you know of?

A. There were two—one at another crossing of the Southern Pacific, about four miles east of Spofford. I don't know whether it is still there.

Q. Now, the next stream, Mr. Ware.

A. The next stream of any size would be the Los Moras.

Q. What is the size of it; what was its former condition and present condition, if you know?

A. When first I knew the Los Moras it was a good running stream, and ten miles below the head there was a lake a mile long
758 by half a mile wide, with quite a lot of game in and around there—good duck hunting. Fellows used to go there duck hunting, but for the last ten or twelve years it has been dry at that point.

Q. What, if anything, was the cause of the diminution of the water in this creek?

A. Scarcity of rain for years.

Q. What is the next stream, which you know?

A. Is the Pinto, six or seven miles west of Spofford.

Q. What is the character of that stream?

A. Well, up to the last seven or eight years it has been a bold-running stream, been gradually sinking for the last ten or fifteen years, until standing in stagnant pools.

Q. What has been the cause of this sinking or diminution of the water, if you know?

A. Scarcity of rain for years.

Q. What is the next stream?

A. Sycamore.

Q. Where is that?

A. Twelve miles east of Del Rio.

Q. What is the character and has been the character of that?

A. That, when I first knew it, was a bold-running stream full of fine fish.

Q. What is its present character?

A. Running this year for the first time in years.

Q. What has been the cause of the diminution of the water in the Sycamore?

A. Scarcity of rains for fifteen years.

Q. The next stream?

A. The San Felipe.

Q. Where is that?

A. Runs through the town of Del Rio.

Q. What was the character of that stream, and what is the present character of the stream?

A. Well, the lower part of it has always been a bold-running stream, but years there was large springs up above the town that have gone dry. Military camp was above, and they got the water from the spring that rose above there. These springs have gone totally dry.

759 Q. What, if you know, was the cause of these streams, or what, in your opinion, has been the cause of their going dry?

A. Scarcity of rain for the last twelve or fifteen years.

Q. What is the next stream?

A. The Simias?

Q. Where is that?

A. Few miles west of Del Rio.

Q. What was the character of that stream, and what is its present character?

A. Bold-running stream in former times, and at points it was from two to three hundred yards wide and several hundred yards longer.

Q. What is the present condition of that stream?

A. It has now good water in it, for the first time in years. It has been totally dry for years.

Q. What, if you know, has been the cause of the diminution of the water in this stream?

A. Scarcity of rain for the last twelve or fifteen years.

Q. What is the next stream?

A. Devil's River.

Q. What has been the character of the Devil's River?

A. The Devil's River has always been a bold-running stream.

Q. Do you know the Pecos River?

A. I do.

Q. Do you know particularly of the other streams in Texas, above Del Rio, that empty in the Rio Grande?

A. Up to Presidio.

Q. What is the largest of the streams, and which flows the more water into the Rio Grande than any of its other tributaries in that State?

A. Devil's River.

Q. When did you first know the Devil's River?

A. Fall of 1881, I believe it was.

Q. What is the average difference in the flow of the water in the Devil's River, if you know?

A. There is less water than there was in former years, but it has maintained nearer its original capacity than any other river in that country, that I know of.

Q. When did you first know the Pecos River?

760 A. In the early part of 1882, I believe.

Q. What knowledge did you have of that river? How did you obtain your knowledge of the river?

A. Camping on it; crossing and recrossing it.

Q. Where and at what points?

A. Mile and a half above the mouth, at the old Bullis Trail.

Q. When did you last see this river—the Pecos?

A. Five years ago.

Q. What knowledge did you have of it at that time?

A. Well, it was almost dark as I crossed it on the railroad bridge. I had camped on it, about eighteen days ago, at the mouth of it. About four days before Thanksgiving Day I camped at the mouth of it.

Q. What, if you know, is the condition of the water of the Pecos River, with reference to its former condition?

A. Well, it is a river that varies. Sometimes it has a quantity of water and sometimes very little, and the fact of the matter is I saw less water in the Pecos in 1882 than I ever have seen since—lower at that time than I have ever seen it since.

Q. Has the water in the Pecos diminished in anything like the same proportion, since you first knew it, as has the water in the other streams which you have mentioned, with the exception of the Devil's River?

A. No; it has not.

Q. What streams do you know which come in from the Mexican side of the river?

A. There is a large stream between the Devil's River and the Pecos.

Q. Go ahead with that.

A. That is known as the Good Enough.

Q. That comes from the Texas side?

A. Yes, sir.

Q. What is and has been the character of that stream?

761 A. I don't know that I have ever seen any portion of that stream. It comes from a spring about a mile and a half from the river, and apparently is the same body of water every time I passed there.

Q. About what is the size of the Good Enough?

A. Runs a body of water about as wide as this room and about a foot and a half deep.

Q. Now, taking up the other side of the river?

A. There is a river comes in immediately below Piedras Negras or Porfelia Dias, opposite Eagle Pass—it is a river that comes in a couple of miles below there. They call it the Regita. I don't know what the proper name of it is. It carries a considerable body of water. That rises at some springs that I know of, that supply the river, that are up at Saray, about forty miles from the mouth.

Q. Is there any irrigation on this stream?

A. Considerable.

Q. What is the next stream coming up?

A. The next stream that I am familiar with is the San Diego.

Q. What is the character of that stream?

A. When first I knew that stream, probably fifteen years ago, it was a big, bold-running stream, not fordable, except in places miles apart.

Q. What is the character of that stream now?

A. I have not been on the San Diego in a couple of years, but when there last it was very low.

Q. What, if you know, was the cause of the diminution?

A. Scarcity of the rainfall for years.

Q. What is the next stream that you—

A. The next stream is the Los Bacas, immediately opposite Del Rio.

Q. What is the character of that stream, and what has been its character?

A. It was a bold-running stream, with large pools and big ponds, and now it is almost dry.

Q. What, if you know, has been the cause of the diminution of the volume of water in this stream?

762 A. Scarcity of rain for years.

Q. What is the next stream that you know?

A. Treienteuno.

Q. Where is that stream?

A. That comes in seven miles above Del Rio, on the Mexican side.

Q. What has been the character of that stream?

A. It has been a much larger stream than it is now; it carries less water.

Q. Do you know the cause?

A. Scarcity of rains.

Q. The next stream?

A. There are no other running streams on the Mexican side until you get, probably, to the San Carlos. That is the only stream that carries any water into the Rio Grande at all, and I don't think it carries water into it except after heavy rains. There are more small springs.

Q. Up to what place?

A. Up to the mouth of the Concho.

Q. What is the character of the Concho or Conchos?

A. Well, I never was at the Concho but once, and then it was after, you might say, an unusual rain. It had rained at least thirty-six hours. It was raining while I was there, and had been raining almost thirty-six hours. There was a large flow of water in it.

Q. What is the width, do you suppose, of the channel where you saw it?

A. It is very wide. There are numerous islands right at the junction of the two rivers; therefore I don't know what surface the body of the water proper could cover if there were no islands in it.

Q. When were you at the mouth of the Concho?

A. I can tell by referring to my notebook. I arrived there on the 3rd day of October, in time for dinner.

Q. What year?

A. This year.

Q. What was the occasion of your going to the mouth of the Concho?

A. Well, I knew a Mr. Hill, United States geologist; met him 763 in Washington several years ago, and he spoke about a trip down the Rio Grande. Wanted to make a geological trip down there, and this year, in September, he came out to Texas for the purpose of making that trip. Wired me from El Paso to meet him at the train, and wanted me to go with him down the river. I told him that we could either put our boats in at El Paso or at old Camp Rice, and he said well, he would be willing to put the boats in at Camp Rice.

Q. Where is Camp Rice?

A. It is by rail, I believe, sixty-four miles below El Paso, called Fort Hancock. We wired to El Paso and wired to Fort Hancock, and got answers back that there was no water in the river, and therefore we couldn't go in there—

Mr. CHILDERS. I don't suppose that is material.

A. The reason we didn't go in above the mouth of the Concho was there was no water—couldn't take the boats down.

Q. Why did you go to the mouth of the Concho?

A. It was the first place on the river where we could float a shingle.

Q. Where did that water come from?

A. The Concho.

Q. Now, just detail what you did, where you went, how long it took you, and what you observed along the route, if you went anywhere, from the mouth of the Concho at this time. State in your own way, and if

you have kept a diary and notebook of what occurred, you can refresh your memory by referring to it.

A. We put our boats in the river at the mouth of the Concho, and came down as far as Langtry.

Q. What day did you say that you started?

A. Arrived there on the third, I believe it was, and remained there a couple of days. We started everything from Presidio del Norte at 10.30 of the morning of the fifth of October.

Q. Well, where did you go? What was the character, I will ask you, of the weather while you were camped at the mouth and below the mouth?

A. It rained almost constantly from the time we got there until we left—left in the rain.

764 Q. Who were with you, if anyone?

A. Robert T. Hill, United States geologist, Mr. McMahan, a witness here, and six or seven other men.

Q. How many boats did you have—have more than one?

A. We had three boats, and two men to a boat.

Q. What was the purpose of this expedition?

A. Make a geological survey of the river.

Q. Had anyone else gone down that river from the mouth of the Concho, through the great bend and the cañon of the Rio Grande, if you know?

A. Mr. McMahon had; yes, sir.

Q. Had anyone else?

A. Not that I am personally acquainted with. I don't know but if some one went with him once. I think he did go with them from Presidio del Norte, and probably from El Paso took some one with him.

Q. Now just take up your trip and tell the court all about it, Mr. Ware.

A. We started with probably an eighteen or twenty inch rise of water above the normal state of water in the river.

Q. Where did that rise of water come from?

A. From the Concho on the Mexican side. The Rio Grande was dry about the mouth of the Concho. The rain had been falling, but had not affected the Rio Grande; did not make the Rio Grande run above the mouth of the Concho.

Q. Well, just go ahead and tell the court what you did and what you saw in that river; character of the water, effect on the bottom, etc., and also distances of the places from the mouth of the Concho, where you went.

A. The first day, after leaving—these are the estimates of distances, of course, I measured by—

Q. Upon what did you form your estimates?

A. We had watches and a clock along. Had a clock in my boat, and we could note the time that we would leave, and estimate what rate of current we were traveling on, and calculate that way how many miles we were making an hour, and how many a day.

765 Q. Did you yourself make these estimates, or your assistants?

A. I made these, and consulted with Mr. McMahan, and sometimes with Mr. Hill. We would get together and discuss the matter, and find

out about what each one thought we had made a day. Calculate that we had travelled so many hours, and so much current, and so much for stops and getting over bars and shoals, and we would agreed upon about what was the approximate distance we had traveled. Sometimes we probably might make more miles than we figured, and sometimes less. The first day, after leaving Presidio del Norte at 10:30 in the morning, traveled to a bend where we camped; estimated 18 miles from where we had left. That was on the 5th day of October. On the 6th we traveled to a point half a mile above Huelvo, a settlement on the Texas side. Remained there over night.

Q. What was the estimated distance?

A. We estimated that was fifteen miles from where we stopped that day. On the 7th we left Huelvo (Pulvo) about 8 o'clock in the morning; traveled 15 miles that day. Part of that river was very bad rapids, which we had to get out of our boats and lower them over by ropes, and lift them over.

Q. To what depth and to what lift did you have to get your boats over?

A. At that point it is a series—I have got a note here that we went over six bad rapids. None of these rapids that we had to absolutely lift them clear out of the water and take them on the bank, lift them between large portages and over rocks projecting out of the water. On Sunday, the 8th, we traveled 8 miles. I have a note of eight bad rapids here, and bad cañon country. We then get out into open valley country.

Q. Kind'a into what you call a cañon country?

A. Not exactly cañon with precipices, but mountains rising gradually out from the river, and the hills come into the river bank; no valley. On Monday, the 9th, we travelled 16 miles.

Mr. CHILDERS. What day was that?

A. Monday, the 9th day of October; mostly bad river; camped 5 miles below Aborada ranch. On Tuesday, the 10th, we travelled 10 miles; camped about a mile above the Grand Cañon; bad rapids on that day's travel; made our travelling hard. On Wednesday, the 11th, we travelled 4 miles; that took us probably 3 miles into the cañon proper, as we camped a mile above the mouth of the cañon, and there we came to where the walls of the cañon had fallen in and filled the river up. Camped there three days, pulling our boats up from the rocks.

Q. You say the walls had fallen in and filled the river up? What was the height of the walls?

A. Walls went up there perpendicular from 600 to 800—1,000 feet. The sun didn't get into it until about 10 o'clock in the day, and four in the afternoon the sun didn't shine.

Q. What was the character of the impediment made by the caving in or falling in of those walls?

A. Large blocks of rock, big as an average house; a great many larger, probably, had fallen in and closed up the channel so that the water worked its way in between the rocks. Had to pull our boats up by ropes to get them through there.

Q. How high did you have to lift your boats?

A. Pulled them up probably twenty-five feet above the level of the

river; that was the lowest rocks we could find to get over. Some of the walls had fallen in and caved in to where the rocks run up against the banks probably 120, 30, or 40 feet. The geologists measured 180 feet at one place.

Q. And how long did you say you were there making the portage?
767

A. On Wednesday, the 11th, we arrived there; got stuck at that place; that we called "Hell's Door." On the 12th still had work there. Worked all day at Hell's Door transporting boats; work not completed. On the 13th we were still at that place, and we started to load our boats, and, well, we had got our boats below these rocks, and there were a bad series of rapids about half a hundred yards; and while we were loading our boats and bringing the bed and camp outfit from our camp, which was probably 300 feet off of the river, we found the river had risen about a foot, and our boat was full of water.

Q. What was the occasion of that rise?

A. We had heard heavy thunder and saw black clouds for a day or two, and was expecting a good rain in the cañon, but the rain had fallen somewhere above and filled the river, and it rose as we were about to start out. We got sixty or eighty feet from these rapids; got pretty well down to the foot of the rapids, and had to portage our stuff again and reload our boats, and still there were some more bad rocks and reefs, and we stayed there to the following day. The following day, seeing that the river was not going to rise any more, concluded to take chances and get out of there.

Q. About what was the rise in the river?

A. About three feet.

Q. What was the width between the walls of the cañon at this "Hell's Door," as you call it?

A. Probably 100 to 150 feet between the walls of the cañon.

Q. Please go ahead and give us the distance from Hell's Door to your next stopping place?

A. On Saturday, the 14th, we left our camp at the foot of these rapids at 8 o'clock in the morning, and after two hours of travelling were out of the cañon. We estimated that we were travelling a little over five miles an hour; the current was even, the channel narrow, and a good stage of water, making about five miles an hour, sometimes holding back instead of going forward. That day we travelled twenty-five miles.

768 Q. What point did you camp that night, or anything particular to call your attention to it?

A. Can't recall where we camped that night. I estimate we travelled 25 miles that day, and camped in comparatively open country; after getting out of the cañon, we came into open level country where the prairie and valley comes gradually down to the river, and a three-foot rise would make the river half a mile wide there.

Q. What was the character of the bed of the river at that point?

A. Immediately after getting out of the cañon, the river beds were sand and gravel and quicksands at the mouth of the creek known as the Torlingo comes in there.

Q. Is that about where you camped?

A. No; we camped about fifteen miles below.

Q. You had passed the Torlingo?

A. Yes, sir; immediately on getting through the cañon the Torlingo Creek comes in, on the north side.

Q. That is from the Texas side.

A. From the Texas side; yes, sir. On the 15th we travelled 27 miles. Sunday, October 15th, mostly open country and level there—great number of sand bars and quicksands, and gravel bars all along the river. And some places the river had divided up into channels where we had to pull our boats through; sometimes had to lift our boats and drag them through these channels. If it hadn't been for the rise we had there would have been, you might say, no water in the river; couldn't have floated anything down. On the 17th, travelled 21 miles; arrived at Boquillas at 4 o'clock in the afternoon.

Q. What is Boquillas?

A. A mining town on the Mexican side, with a smelter near the city. They have got a trail from which they bring the ore from the smelter from the Mexican side. I think it is 95 miles to Marathon, and there is a wagon or coal and coke road from Marathon into Boquillas.

769 That 21 miles of travel was through a good deal of open country, very little cañon, large gravelly bars—sand bars, and some little country that they formerly had under irrigation, vega country.

Q. Vega means a muddy or naturally grass country?

A. Subject to irrigation. It is a valley that is subject to overflow in high water. Before reaching Boquillas we passed the first tributary, which you could call a tributary, that furnished water to the Rio Grande, and they were three small streams. On Wednesday, the 18th, we left Boquillas, and travelled fifteen miles. The town of Boquillas is right at the mouth of the cañon; that is the old town on the Mexican side; but the town on the American side and company's headquarters there, where they have got a store, is two or three miles above the town on the Mexican side. It is comparatively open country until you get down to the old Mexican town, and then you shoot right into the cañon, like going into a tunnel. The river is very swift, and tiers of rapids almost all the way through. Travelled fifteen miles, and camped in the cañon that night. On Thursday, the 19th, we estimated we travelled eighteen miles, 12 miles of which were through the cañon country and 6 miles were through open valley country, with big banks and cobble stones and sand bars and gravel that had been piled up by the force of the water coming out of the cañon, and there we stopped at the place known as the Old Stevens Ranch. Camped there over night. On the 20th we estimated we travelled 30 miles. From Stevens ranch went three miles below to the mouth of the Maravillas Creek. It rises up near Marathon.

Q. What is the character of that creek, Maravillas, if you know?

A. It has no running water. I travelled up it on horseback one time. We found no running water until we got within about twenty miles of Marathon. We followed it up about seventy miles before we came to any running water, and then we found some springs up there, and we followed the river fifteen or sixteen miles where it had running
770 water, and then it sinks into the gravel; when it gets about seventy miles—in freshets it has a great body of water—great number of boulders through into the river near the mouth of it, and bed

rapids. On the 21st we travelled 22 miles and camped three miles below what is known as the Nichols Cañon. That day's travel was mostly through country where the mountains were off from one to two and three and four miles from the river, left a good valley country and great deal of sandy country, great many bends and crooks, and sand bars and gravel bars. On Sunday, the 22d, we travelled 20 miles in half a day. Camped in what is known—what I was told was Horse Cañon, I think. I didn't see any name on the map. It is 23 miles below Nichols Cañon. Travelled twenty miles that day. There is a large boiling warm spring.

Q. What is the character of the bed of the river?

A. Very rocky and full of boulders, and sand bars come in, and willow bushes along the river. On the 23rd we travelled 23 miles, and I made a note here, that the river was very rough, deer plentiful. Camped below a portage, where we had to unload part of our stuff, and one boat swamped at that place. On Tuesday, the 23d, we travelled thirty miles. Tall cañon, and swift rapids. Camped five miles below San Francisco Creek. That is the creek that comes in from—heads up towards Sanderson, on the Southern Pacific Road—comes in from the Texas side—large creek. On the 25th travelled 25 miles. I made a note—cañon; walls were low; met bad rapids. Camped four miles below Shafter Crossing. On the 26th we travelled 45 miles; river good, and banks low. Camped 15 miles below Pool's ranch.

Q. What was the character of the river bed, the bottom, banks, etc.?

A. The river bed in that country is a great deal of sandy bed. Wherever the country is open, wherever you come out of the cañon, you get into open country, where the valleys come down gradually to the river; it is sand bars, lagoons. The river is spread out into different channels. You sometimes run your boat into a channel, and if the current is not big the first thing you know you are aground and dry, first one and then another. Most of the days that we travelled was through pretty open country, and a good deal of sand and gravel bars, and swift current generally. On Friday, the 27th, reached Langtry, after fifty miles travel that day. River swift; no very bad rapids. The geologists left the river and myself and McMahan and one of the other boatmen went on down the river home. I left my boat there and took it down sometime afterward. Took it down a few days before Thanksgiving day. You want to know the nature of the river from Langtry on down the river?

Q. You know that?

A. I left him the Thursday before Thanksgiving—that is seven days before Thanksgiving, and went and took my boat down the river—down home. I don't remember the date. I left on Friday before Thanksgiving. I left there and went down to Del Rio. I haven't got those dates. It was six days before Thanksgiving when I got in the river in Langtry, and I made the trip down, I think—it was in four or five days.

Q. What is the character of the river between Langtry and Del Rio?

A. It is mostly cañon, although the walls down, as a general thing, run up more than two or three hundred feet high. There are several places in thirty miles between Langtry and the mouth of the Pecos where sheep, cattle, and goats come in to water—that is from one bank.

Q. How far is it—

A. Thirty miles by river.

Q. And from Pecos to Del Rio?

A. From Pecos to Del Rio I should say—I did have an estimate of all the distances.

772 Q. I will ask you first, what is the distance by river from the mouth of the Concho to the mouth of the Pecos?

A. I made an estimate of our different camping grounds and distances, and from the mouth of the Concho to Langtry is 462 miles, according to the camps we made, and to the mouth of the Pecos is 492, and to Devil's River it would be 542, and to Del Rio 562, and Eagle Pass 657.

Q. What is it to Devil's River, please?

A. To Devil's River is 542 miles from the mouth of the Conchos.

Q. And to Del Rio?

A. To Del Rio is 562, and to Eagle Pass would be—this is just an estimate from Del Rio down. Never made the trip by boat; know the country by going across by wagon and horseback from Laredo. I estimate that the complete distance from the mouth of the Conchos to Eagle Pass would be 657 miles, and then it is 250 miles from there to Laredo, or 110 by wagon road. I think that is the usual estimate. As a general thing, where you travel one mile by horseback or wagon, you travel two and a half or three by river.

Q. Mr. Ware, what is the character—general character—except in these particular points that you have stated, where the lowlands come in down to the river, *but* the general character of this great bend through which you travelled from the mouth of the Concho to Langtry, as to the surface ground, the banks of the river, etc.? Are they rock banks, or are they cut up with cañons, or how?

A. Along the walls of the river, in the cañons proper, there are occasionally deep cañons coming in, very deep and swift.

Q. What is the evidence, if any, the visible sign, if any, of water courses coming into the river through dry arroyos or running streams?

A. There are numerous cañons that empty big bodies of water in, but I never saw them running.

Q. From what could you see that they empty big bodies of water into the river?

773 A. Where the cañons would come in on the Mexican side you would see boulders piled up on the Texas side, where the force of the water had thrown them up, completely across the river, and piled them up.

Q. Could you see the course of these streams across the bed of the Rio Grande by the cobblestones, etc.?

A. It generally forms a rapid at the mouth of these cañons, where these boulders are thrown out.

Q. Now, is the horseback or wagon travel on the banks of the river around this great bend, is it possible or feasible?

A. Well, it is utterly impossible to go by wagon.

Q. What would be the distance in travelling around that way, along on the banks of the river; could you make it at all?

A. You would go no considerable distance without striking a cañon, and probably if you were on the bluffs of the Rio Grande you would come to the cañon that you would have to follow up thirty or forty miles before you could get to a crossing, and in a country without any sign of water, except after the rains.

Q. What is the character at any point, or at different points, over which you travelled, of the bed of the stream, or of the immediate valley, with reference to growth of grass, weeds, roots of any growth, that you found, if you know—if you remember a place on the trip down the river in particular?

A. I notice there is a weed or grass probably this high [indicating about four feet]. It is a reddish color, and that is a weed that doesn't grow in the water itself, but where there is a good deal of subirrigation, and after we passed the grand cañon and got down into that valley country and found that it was growing continuously across the river—the whole way across, and we stopped at a smuggler's camp, and there was an American there. I spoke to him and asked him if the river wasn't on a rise. He said, yes, the rise had been—if you had been along
774 here a few days ago you would have found no water, and we saw from those facts that the river must have been almost dry. There was no place where you could have stepped, however, without getting wet over a pair of ordinary gaiters.

Q. This was in the actual channel bed of the Rio Grande?

A. In the bed that is in use when there was any water in the river.

Q. And that was below what you call the Grand Cañon where the walls were caved in?

A. Probably twelve miles below.

Q. Is that above or below the Pecos?

A. About the Pecos.

Q. And above Devil's River?

A. And above Devil's River. We found quite a number of places where the weeds grew complete across the river, and after having this rise we still had to drag our boats over the deepest channel we could find—didn't have four feet of water in it.

Q. Did you find an open space for your boats, or were you compelled to drag your boats across the weeds?

A. We slid our boats through the weeds. There had been a rise, and it gave sufficient water to come through the weeds without having to drag them.

Q. Mr. Ware, what has been the general condition of that country with which you are familiar in and around Del Rio and that section since you first knew the Rio Grande? You say you first knew it in 1879; what has been its condition with reference to rainfall—what have been the conditions with reference to rainfall since you first knew the river?

A. The first two years I was living down there, anywheres close to the Rio Grande, there was considerable rain. Since 1883—1883-4 and 5 we have had a continuous drought—little or no rain. Lost a great proportion of cattle, probably fifty, sixty, or seventy per cent of the cattle.

Q. That was down near your section, Del Rio?

A. Yes, sir; down near Del Rio.

Q. Since that time how has it been?

775 A. Since that time—since 1886—we have never had what you could call a good season; no rain to make good stock or good grass up to this last year.

Q. When you first knew that country, what was the condition of the country with reference to grass?

A. Well, you could go in any direction over that country and see splendid stock grass, and running streams, from eight or ten miles at the most, running up and down the Rio Grande.

Q. What is and has been the condition of that country for the last few years, or since 1885-6 and 1889?

A. Well, all the streams between the Devil's River and Eagle Pass have gone dry, with the exception of the San Felipe—that is, the Alamo, the Los Moras, Piedras Pinto, Sycamore, and the Suaz Creek.

Q. What is the condition of that country now with reference to grass or of growth of any kind?

A. Well, we have some grass now; but not as it used to be fifteen or eighteen years ago. We have fair grass and lots of water at the present time from this year's rain.

Q. What has been the condition prior to this year?

A. For the ten years previous it was very dry.

Q. What has been the result of this drought in that country upon the surface of the earth and upon cattle trails or other trails into the water holes or points where they go to water?

A. There was literally no grass for miles off the river, between Eagle Pass and Pecos, and how much further west I don't know.

Q. What is the condition now with reference to the rain this fall as compared with conditions in former years, when there was grass upon the ground, as to the absorption by the ground of the rainfall?

A. The water absorbs less water now than it did when there was no grass on the ground.

Q. What becomes of the water now?

776 A. There is nothing now to prevent the water running directly into the streams and running off. Before it had to filter through the grass.

Q. What has been the result, if any, with reference to strong floods at the present time, and comparing it with the time previous when there was grass upon the ground, do the floods now last as long as they did then?

A. No; certainly not. The water reaches the bed of the stream quicker now. When there was grass there it had to filter through the grass, and it took some time, and more seeped into the ground and less of it got into the river beds and creeks.

Q. You have stated that you lived at Fort McKavett and at different parts of Texas, in the southwestern portion of Texas, besides the time that you have spent at Del Rio, on the Rio Grande. What has been your observation, if anything, with reference to streams of water throughout that section of Texas during the last few years or during the time which you have known it?

A. In fact, every stream that I know of has got less water in it—probably with the exception of the Good Enough stream, every stream in west Texas and southwest Texas has less water in it than it had twenty years ago, and less water ten years ago than it had, and less water than it had five years.

Q. Can you mention the names of any streams which you recall now beyond those which you have mentioned as immediate tributaries of the

Rio Grande in that section of the country which have changed in their condition, of which you have knowledge?

A. Not immediate tributaries.

Q. I mean besides the immediate tributaries. Can you mention any other streams?

A. The Nueces used to be a running stream at the stage crossing at Fort Clark. It hasn't run in years more than a day or two. Turkey Creek was the the same way. Leona was the same way.

777 Q. Where is the Leona?

A. I am not positive whether it is called the Leona or Leon. Six miles west of San Antonio. There is a Leona which runs through the town of Uvalde. Both of them are running streams.

Q. You say that you knew them in former times to be bold, running streams?

A. Yes, sir.

Q. What's its condition now?

A. Dry; totally dry.

Q. Can you mention any others?

A. Yes; the Frio used to run at the crossing.

Q. Did it just run occasionally or was it a running stream?

A. Almost always a running stream at the crossing. It was a long ways from the railroad.

Q. Its condition now?

A. Is dry.

Q. And for the last few years?

A. Has been dry for several years.

Q. And the others?

A. The Sabinas was a fine running stream twenty years ago.

Q. What's its general condition now?

A. Dry occasionally; that is, stagnant pool. I speak of these rivers at the old stage crossing—the road that I used to travel. That is close to the present line of the Southern Pacific Railroad now.

Q. You mentioned the Escondido, a tributary to the Rio Grande?

A. That is on the Mexican side.

778 And now, at this the hour of 12 o'clock noon, an adjournment of the hearing and trial of the cause is taken until 2 o'clock p. m. of this the 15th day of December, 1899.

And now, at this the hour of 2 o'clock p. m., the hearing of trial of this cause is resumed.

Present as before.

H. K. WARE (direct examination continued).

Examined by Judge A. B. FALL: Mr. Ware, from your knowledge of the tributaries of the Rio Grande, in the section which you have been questioned about, can you give approximately the watersheds of the drainage of the different tributaries flowing into the Rio Grande below El Paso and above your place?

A. Some of them I can.

Q. Will you be kind enough to tell the court what is the drainage, approximately?

A. Which particular stream?

Q. Whichever one you know of; proceed in your own way.

A. Well, the Concho drains a large tract of country. I don't know how far west from the mouth it heads in, but it's on the north side of the Mexican Central road and drains a country probably 300 miles or more long.

Q. Do you know anything about the country drained by the San Juan?

779 A. No; I never saw any part of the country.

Q. Do you know anything of the country drained by the Pecos?

A. I do.

Q. About what extent of country, more or less, if you know?

A. Well, the Pecos must be, from the mouth to the head waters of it, close to a thousand miles long, taking the meanderings of the river; and the valley, as far as I know it—I haven't seen it beyond the old Tackles crossing, the overland stage crossing, which is something over 200 miles from the river to the mouth—I crossed it in the overland stage 20 or 25 years ago; above that I don't know much of anything.

Q. About what is the drainage of the Pecos; how much country on each side, as far as you know, does it drain?

A. On the west side, beyond the old pontoon bridge, the drainage is very narrow there because it is a very short distance until you get to the backbone that forms the divide between the Pecos and the Devils River, and it drains a slope of country on an average, probably, from the mouth, twenty miles. It doesn't drain on the east side—say ten or twenty miles wide—on the east side of the Pecos. The waters further on east of that come into the Devils River.

Q. Now, where does the Devils River flow, did you say; where does that empty?

A. Empties twelve miles above Del Rio into the Rio Grande.

Q. Then the drainage of the Devils River would also be into the Rio Grande?

A. Yes, sir.

Q. From that river?

A. Yes, sir.

Q. What, if anything, is the drainage lengthwise of the Devils River?

A. The Devils River rises up near Sonora, in Sutton County, about 150 miles in a direct line almost north from the mouth, and its drainage—well, there is one fork of the Devils River, which comes
780 in from the east, known as the dry fork. Take the dry fork and the main fork, together they drain a distance of country probably 50 miles wide until you get to the mouth where the two rivers come together, and from there down it is from ten to twenty miles wide. It is about fifty miles from the dry Devils River to the Rio Grande.

Q. Now, what is the next river east of any extent—the next east to the Devils River in that section of Texas?

A. The next river of any considerable size would be the Sycamore.

Q. That would be east of the Devils River?

A. 24 miles east. There are two or three small creeks in around there.

Q. What is the next great drain of these rivers, which are tributaries of the Rio Grande, in the State of Texas, flowing into the Rio Grande?

A. That would be the Nueces.

Q. Into what does the Nueces flow?

A. Into the Gulf of Mexico, east of the town of Corpus Christi.

Q. About where is the dividing line of the drain of the Nueces and the tributaries of the Rio Grande in Texas—how far from the Rio Grande would be the dividing line?

A. About twenty miles due north, or probably a little east of north, of Eagle Pass you would find the watershed.

Q. Now, on the Mexican side, you have stated that the San Juan or the Conchos—you are not familiar with any of the head waters, but you know that it is still running near the Mexican Central road, and that there must be 350 miles?

A. I should say from the map that it must be at least that long.

Q. What, if you know, up and down the Rio Grande, from
781 your knowledge of the country on the Mexican side, is the drainage area, except the Rio Grande? Where does the streams flow except in the Rio Grande?

A. None, except on the Pacific coast.

Q. That is, none anywhere in this part of the Republic?

A. None between the mouth of the Concho—no running stream that comes into the Rio Grande—and the mouth of the Pecos.

Q. I mean to say, taking the section of Mexico that you are acquainted with, which would be the eastern part of Mexico, or from the Concho down to the Gulf, what other large streams or drainage basins are there except those emptying into the Rio Grande?

A. No running streams. There are some dry cañons that carry water on the Mexican side.

Q. Have you ever been to Monterey, in Mexico?

A. Yes, sir.

Q. How far is Monterey from the Rio Grande River?

A. I think about 120 miles—from Laredo over the Mexican International.

Q. Do you know where the waters from the neighborhood of the Monterey drain to?

A. I can't say that I do. There are some streams right at that point, Monterey, but I am not positive where they drain to.

Q. Don't know whether they go away from the Rio Grande or into it?

A. I know there is a large river between Monterey and Eagle Pass or Laredo, Sabinas or Salado.

Q. Where does that go?

A. Into the Rio Grande; further down than I have ever been on the Rio Grande.

Q. Have you ever had any reason to note the floods on the Rio Grande River since you have been living on that stream—since you have known it?

A. Yes; and I have seen very big floods, and also I have seen very little water at different times.

Q. At your place where *do* you live at Del Rio have you in
782 recent years had any knowledge of any floods in the river?

A. Yes, sir.

Q. Can you mention any time or any particular floods?

A. Well, there was a very big flood this last June, but it took place—you might say nine-tenths of it was east of Del Rio. Very little of it came from west of there.

Q. East of Del Rio? Explain what you mean. Was that up the Rio Grande?

A. Down the Rio Grande from Del Rio. Most of the water that fell that caused the rise was to the east of Del Rio.

Q. The river makes a great bend and runs north and south?

A. The general course of the river is east by south.

Q. Now, did you have your attention called to any flood in the year 1899?

A. Now, I don't remember positively the dates. I have seen it at various times, accounts in the papers of unusual rises in the Rio Grande at El Paso.

Q. Do you remember the last account that you had seen of any unusual rise on the Rio Grande at El Paso?

A. I am not positive whether I read any account of a rise this last year or not; seems to me that I did read something about a rise near El Paso. Other occasions I have read of rises that overflowed the town and damaged residences in the lower part of the town.

Q. I will ask you if you have any knowledge of the Rio Grande north of the Concho, where you started in on this last trip?

A. My only personal knowledge of it is seeing it immediately around El Paso, and as we came along the railroad.

Q. How many times during the last fifteen or eighteen years have you been in El Paso?

A. I should say ten times.

Q. From your knowledge then, from your knowledge of the Rio Grande itself and its tributaries, whether running or dry, and of the country on both sides of the Rio Grande, if the tributaries of the Rio Grande below the town of El Paso to the town of Del Rio or Rio Grande City were so cut off from the Rio Grande that no water would run directly or indirectly, by percolation or otherwise, into the Rio Grande, would the flood from El Paso, which would be, say, as wide as either of the bridges across the river at El Paso and up to the span of those bridges, ever reach Rio Grande City?

A. I doubt very much if it would. It would probably be dry at Del Rio in the river bed.

Q. Upon what do you found that statement? Give your reasons for it.

A. From my knowledge of the bed of the river generally, the sand and gravel bars, and the amount of water that these sand and gravel bars will absorb every rainfall and every rise.

Q. You have stated that on this trip down through the great bend in this year that you left the mouth of the Concho on water coming from the Concho, and that at that time there was no water coming from above in the Rio Grande?

A. Yes, sir.

Q. And as I remember your statement, it was to the effect that this water coming from the Conchos was two or three feet of water, or did you so state?

A. Well, from what I could find out from the people living there, what the natural—

Q. But I mean at the time you left; about how much water did you leave on—going down?

A. We left on from eighteen to twenty-four inches of water in the channel.

Q. When you left the mouth of the Concho?

A. There were places where there were eight or ten feet of water, but in the channel we would find eighteen to twenty-four inches.

Q. Did you find more water going down, or less going down?

A. Each day we found less water. The second day out we had to drag our boat over gravel bars where there wasn't over three or four inches of water.

784 Q. How far was that below the mouth of the Concho?

A. That was above Pulva; we were this side of Pulva, three or four miles. Struck a place where the river divided out into little islands and little channels and it took four to six men to pull the boats over these gravel bars to get into deeper water below.

Q. Now in getting into deeper water below, was the water as deep where you found it again as it was when you left the Concho?

A. The water had greatly disappeared.

Q. Did your water practically on which you left the Concho disappear or did it increase as you went down; and if so, where did it either disappear or increase?

A. It decreased every day's travel until we got into the cañon where we got a second rise and carried us out.

Q. If you had not got the second rise, which you said came from the rainfall, would there have been sufficient water to take your boats through the cañon and on down the river?

A. Yes; although we got sufficient water to get through the cañon, but getting through the cañon we would have struck open places of country where there would have been no water.

Q. On what water did you get to enable you to make your journey down the river, the second rise?

A. The water from the second rise enabled us to get down the river by reason of the fact that there was little of the first water left.

Q. Give us, please, the distance in miles, as near as you can, before the first rise was, as you say, practically exhausted.

A. Just before we got to Pulvo the water began to get short, and I will see what the distance was to Pulvo. From mouth of the Concho [refreshing recollection from memorandum book] to Pulvo, 81 miles. That was our sixth camp. Wait a moment. From the mouth of the Concho to Pulvo is 33 miles. We made 18 miles the first and 16 the second day, and that was only 33 miles. From the mouth of the Concho to the mouth of the cañon was 81 miles.

785 Q. Then, as I understand you, within thirty-three miles that foot and a half to two feet of water which you left on was practically exhausted?

A. Oh, no; not until we had gone down into the cañon, because the river narrows in from Pulvo down.

Q. You had been travelling where it was wider?

A. Travelled in open level country and then after leaving Pulvo—after getting ten or fifteen miles below Pulvo—it narrows down. The mountains come in on the Mexican side close to the river and hills on the Texas side.

Q. Then, how far is it, did you say—I have forgotten—from the Concho to the Devil's Door, or Hell's Door?

A. From Presidio del Norte to the mouth of the cañon was 81 miles, and then we camped a mile above the mouth of the cañon that night and the following day I estimate we made a four mile run into the cañon.

Q. Would be about 85 miles.

A. To where we struck where the walls had caved in.

Q. And also you say you wouldn't have had enough water to get through the cañon nor enough to go on if it hadn't been for the second rise?

A. We could have gone all the way through that cañon. We could have gone 16 miles more through the cañon, because the water was very much more scattered. Sometimes after that rise the whole width of the river wasn't over 12 feet wide. The whole body of the water in the cañon was confined to a space probably 12 feet wide. We had sufficient water to get through the cañon, because there was so much water going through a smaller space, but as soon as we get through the cañon to the mouth of Turkey Creek then it opens up into a big, sandy, gravelly country where you can see a cow for several miles from the river if it wasn't for the mesquite brush, and there the river widens out and if we hadn't had the three-foot rise we would have struck bottom.

786 Q. If it had not been for the three-foot rise, could you have prosecuted your journey?

A. We could have gone to the smuggler's camp and taken advantage of the deepest part of the channel.

Q. From your knowledge of the Rio Grande, as you have stated it, what in your opinion would be the effect, so far as to navigability of the river is concerned below Rio Grande City, in Texas, of the construction of the proposed dam and reservoir of the defendants at a point 125 miles above El Paso, as affecting the navigability of the river below?

A. Well, from the fact that none of this water goes through the bridge at El Paso ever gets below Eagle Pass, I don't see how it could affect it by putting the dam in here. I have no doubt that very little of the waters gets to Laredo that goes through this bridge.

Q. What was your former opinion?

A. That was something that surprised me, until I had made this trip over the river and found out what became of those big rises that I used to read of; but after I had made the trip over the country; of course I knew what I had seen of the river immediately below El Paso. I didn't think it was possible to take up all the water until I made that trip and saw what becomes of a rise in a few days' travel—saw it actually disposed of in the same.

Cross-examination. Examined by Mr. CHILDERS:

Q. You made these measurements which you have given as to distances from estimates entirely? I didn't understand that you actually measured them.

A. Oh, no; we didn't measure by chains or anything. It is mere

guesswork as to the number of miles we made each day. Still, I expect they are pretty close.

787 Q. Did you ever measure the velocity of the water at any place?

A. No, sir. It varies at different places; sometimes fifteen miles, and sometimes it is very slow.

Q. Based on guesswork as to the number of miles you made?

A. Estimated by the current and body of water travelled over; the obstructions in the rocks and rapids.

Q. That seemed a pretty long trip?

A. Sometimes we got into camp very tired.

Q. But you wouldn't yourself rely upon that with any sort of accuracy?

A. Yes, sir. I made the estimates myself and consulted with the other boys.

Q. As compared with measurements, you wouldn't rely upon them?

A. I wouldn't swear that I could guess a mile to a hundred yards.

Q. Nothing but estimates?

A. I know I could walk four miles an hour, and would be satisfied that in four hours I had walked sixteen miles.

Q. But you have never done much navigation of this kind before?

A. Been around water all my life.

Q. But then boating and sailing depends a great deal upon the condition—differently from walking on the ground ordinarily. You are pretty familiar with the number of miles you could walk an hour?

A. Yes, sir; I am.

Q. I believe I understood you to say that you went to Del Rio, in what year?

A. I went to Del Rio in the fall of 1881, I believe it was. No; I was there once before——

Q. To live?

A. I went there in 1881.

Q. In what year did your familiarity with this part of the Rio Grande, over which you made that voyage, commence?

A. I never knew anything about the river from Presidio down to Langtry until this last year. Had made trips from Devil's River down to there from the mouth of the Pecos.

Q. From Del Rio up?

A. I never knew anything about the river until I made this trip except by hearsay. It is 121 miles by water and 70 by rail.

Q. You didn't testify anything about the river below Del Rio?

A. Don't know anything about below—been to Laredo.

Q. I will ask you about the different tributaries below Del Rio?

A. Down to what point?

Q. Down to Eagle Pass. How far below Del Rio is Eagle Pass?

A. 62 miles by wagon road and double that by water.

Q. What tributaries are there?

A. Taking the American side, the Pecos comes in immediately opposite Del Rio, and below that the San Diego, about 45 miles below, and then one or two smaller streams that I am not acquainted with on the Texas side. There is the San Felipe comes in a mile below the mouth of the Las Pintas, and twelve miles below is the Sycamore.

Q. Those are the ones you mentioned?

A. Yes, sir.

Q. You mentioned none below Eagle Pass?

A. No, sir.

Q. You said something about some springs. Where did you find those springs?

A. The first springs that we found going down the river were about 12 miles above Boquillas, a warm spring, running a good small stream of water, and it is covered up when there is a five-foot rise of water. There was one a little bit below, on the Texas side, coming out of a gravelly bank, which run some quantity of water.

Q. These were not made by floods or rises?

A. No; I guess not. They had warm water and slightly touched with sulphur. And then immediately above Boquillas there is another spring there, and right at Boquillas a small spring on the Texas side. Struck no springs, as I remember, south of the mouth of Horse Cañon. There was a big boiling spring of warm water just above there; remained there one Sunday to wash up clothing and to rest a little.

789 Q. They do not disappear during the flood season.

A. They are continuous. An old guide that we had with us called our attention to the springs being on the river, and we looked for them. He had known them for years before.

Q. Did you have any previous familiarity with the Rio Grande above Del Rio?

A. Oh, yes; 120 miles up river.

Q. Above the mouth of the Concho?

A. No; not above the mouth of the Concho. Never was on the Rio Grande above the Concho except at Camp Rice.

Q. You say you saw the Pecos in 1882 for the first time?

A. Some time like that.

Q. You think that then it wasn't like it is now?

A. I think it was like then. I only seen it once.

Q. Between 1882 and the last year how many times did you see it?

A. Oh, I seen it, I guess, probably ten or fifteen times.

Q. At what places?

A. At the high bridge where the present railroad crossing is. I was there several times during the construction of the bridge. Crossed it on a foot plank from bank to bank.

Q. What year was that?

A. Since 1882; about twenty years ago.

Q. That is on the Texas Pacific?

A. Yes, sir; six miles above the mouth of the Pecos. The crossing used to be at the mouth.

Q. That is the Southern Pacific, the San Antonio branch of the Southern Pacific?

A. Galveston, Houston & San Antonio road, part of the Southern Pacific.

Q. And you say that was after 1882?

A. Saw it several times afterwards; camped at the mouth of it several times afterwards. Camped there in November about ten days. Thanksgiving, November, camped at the mouth of it for two or three days duck hunting there.

790 Q. Is that the place you referred to when you say you saw it in 1882, when it was so low?

A. Right at the mouth you can't tell whether it is high or low, the Rio Grande backs into it.

Q. I mean in 1882, when you saw it.

A. At Pauls Crossing (?), a little over a mile and a half from the Rio Grande, up the cañon.

Q. When did you last see it there?

A. About fifteen days ago.

Q. You say it had more water then than it did in 1882?

A. Oh, yes; as there had been a rain for a day or two. In 1882 why there was no water in it to amount to anything. The last time there was a large body of water in it.

Q. What time of the year did you see it in 1882?

A. I must have seen it as many as ten or fifteen times. It was during the construction of this Southern Pacific Railroad, and I was there a great deal.

Q. At all seasons of the year?

A. During pretty near all of that year I had business with the contractors during the construction, and some of the boys had a camp at the mouth of the river.

Q. Covering a period of how many months did you see it?

A. I hardly missed a month being there.

Q. No variation to the mouth of the river?

A. Oh, yes; sometimes it overflowed. In 1882 it varied more or less, no doubt, every week, but the lowest stage I ever saw was on the occasion of my first visit there.

Q. What month was that?

A. I can't recall what month it was. It was some time during the winter.

Q. Did it rise during that year?

A. I don't recall whether it rose fifty times, or whether it didn't rise at all.

791 Q. Did you see any unusual body of water at that time?

A. It seems to me that from the time I saw it the first time it had a little more water than on the occasion of my first visit.

Q. You don't know anything about what kind of a season they had had in New Mexico?

A. Don't know anything about that.

Q. You say you have seen it how often since 1882?

A. I have seen it time and again.

Q. How far up above the mouth?

A. Sometimes right at its mouth, when I make trips in a boat, hunting and fishing, and sometimes when I cross on the Southern Pacific road.

Q. There has been no sort of regularity in the flow of the river, as you have seen it?

A. You might see the Pecos to-day with a foot of water in it, and to-morrow with twenty feet of water.

Q. Are there any considerable tributaries between the mouth and Eddy?

A. There is the Live Oak comes in some distance above, and there are some other tributaries. I am not personally acquainted with them.

Q. No considerable ones that you know of?

A. There are some creeks and small streams running into it.

Q. Below the town of Eddy or Carlsbad I am speaking of?

A. I never saw the Pecos above the Texas & Pacific road. I have crossed on the Atchison, Topeka & Santa Fe—crossed the Pecos there, but never was above Pecos City.

Q. Do you know where its water supply comes from?

A. Merely know from what's on the map. Don't know that there is any such place as Eddy, only from hearsay and the map.

Q. You don't know from the map, or any source of information, of any considerable increase in the water supply below that place?

A. Seven Rivers and Black Rivers, that I know of.

Q. Are they not above Carlsbad?

A. I have never been at them myself; know nothing about them beyond hearsay.

Q. You say there was some weeds growing across the river below what you call the Grand Cañon?

A. Yes, sir.

Q. What kind of vegetation is that?

A. A weed that grows probably fifteen or eighteen inches high. It looks like buckwheat—reddish top to it.

Q. Caused by subirrigation. It grows wherever the water has overflowed?

A. It grows in a sandy and gravelly soil, where there is water close by.

Q. It requires water in the soil?

A. Yes, sir; it can not grow unless there is water.

Q. You spoke something about some vegas; how much of that kind of land did you see up and down the Rio Grande on your trip?

A. By vegas I mean bunches of land that are probably from six to twelve feet above the low stage of water, and subject to overflow in high-water seasons.

Q. It requires subirrigation to produce vegetation of that kind?

A. Yes, sir; sometimes they raise a crop every three years.

Q. This soil grows a good deal of these kind of weeds; what we call vegas up in this country?

A. It is a sandy soil; it is deposited from the heavy overflows.

Q. Do they cut hay off of those vegas?

A. Didn't see any hay being cut; there are very few people living along there. We saw in one or two places where there were some small settlements, where they were raising watermelons and some little corn. It was by natural rainfall and subirrigation.

Q. When did you say that you were at that point, where you saw the weeds growing across the river?

A. They grew below the cañon in open valleys.

Q. You might see them growing anywhere and everywhere in the river, where there is any soil to grow on?

A. From the mouth of the Concho down is my experience.

Q. About what date was it that you struck that place where you say you took your boat through those weeds?

A. That was the second day out. When we were a few miles from Pulvo,

Q. About the 33 miles below the Concho?

A. I think it was about that. The first day travelled 18 miles; next day travelled 15 miles. Well, now this particular place that I speak of where these weeds were growing in the river, must have been about three miles above Pulvo. Along in that country the weeds were submerged three to six inches deep in the water, and then where we struck these weeds they grew completely across the river. I noticed them particularly at this smuggler's camp about fifteen miles below the Grand Cañon. I particularly noticed more of them then than I did anywhere else.

Q. Now you say that the second rise struck you in the Grand Cañon, I believe?

A. Yes, sir.

Q. And you say that none of the water ever reached Del Rio—none of the first rise?

A. I don't know how much of the first rise could have reached Del Rio. We got down to where there was very little water. You can tell how much of a rise there was here by looking at the bank; for instance, the river here at El Paso after part of a rise has gone back; and I saw a deposit of brush showing that the river was a foot higher than it is to-day, then going down probably thirty miles, would see a deposit, say, only six inches, showing that the river had been only six inches, where from thirty to fifty miles above it had been a foot high.

Q. Now the first rise that took your boat out, you say that came from the Concho?

A. Yes, sir.

Q. You are positive that you had no water from El Paso?

A. Yes; I am positive.

Q. Why are you positive about that?

794 A. Because while we were laying at Presidio del Norte, waiting for our boats to come down by wagon, I took a man and went hunting and I hunted in around the mouth of the Concho, and went up the river to where there wasn't any water in the main channel of the Rio Grande, and there was water running out of the Concho.

Q. No water there; was there any rise in El Paso at that time, from the information you had?

A. The information we had there was no water at El Paso and none at Camp Rice.

Q. You don't know whether any came down from there or not?

A. It might have been coming down behind us, but it didn't reach us while we were there. After we passed, I don't know what happened in the Rio Grande up above the Concho. There may have been a twenty-foot rise for all I know.

Q. And it is only a matter of opinion that none of it would have reached you if there had been a rise in El Paso up to the bottom of the bridge timbers?

A. I don't know how much of it would have reached the Concho, but I shouldn't suppose a very small quantity, unless it was a continuous rise that would last more than ten days, to make any considerable volume of water below the Concho.

Q. You don't mean to say if there had been a continuous prevailing wet season for any considerable length of time; if there had been any

such season sufficient to fill up the porous bed of the river, that none of it would have reached the Concho? Suppose that the rains lasted up there for a month—continuous heavy rains in northern New Mexico—you don't mean to say that none of that would reach the Concho?

A. It would depend upon how much was coming in from the tributaries below.

Q. That is a mere matter of opinion?

A. Yes; a mere matter of opinion and pretty well founded.

795 (NOTE.—Stenographer here taken sick, and taking of evidence is continued by H. B. Holt. In changing stenographers, a few questions and answers may be omitted.)

796 (Testimony in the case, taken by H. B. Holt, stenographer.)

Q. You do not pretend to say that if there should happen to be two or three successive good seasons of rain in this whole section of northern country—plenty of snow in the Colorado Mountains—that there might not have been some water reach there, do you?

A. If the tributaries of the Concho and other rivers were cut off?

Q. Yes, sir.

A. I mean to say that the tributaries of the Concho, and Pecos, and Devils River, and these other tributaries—if they were cut off, there has not been a rise pass the city of El Paso for twenty years that would reach Del Rio, and I would be willing to bet a thousand dollars to a hundred that it is the case—pretty near it.

Q. Don't know anything about that before 20 years ago?

A. I don't know what they may have had before 20 years.

Q. If there was a continuous stream of water in the river from anywhere towards its source all the way through to El Paso, on down the river to Del Rio and Laredo to its mouth, would you undertake to say no water from the northern part of the river reached down there?

A. Not with these railroad bridges standing and lower part of the city standing. None of that city would be standing when you run a body of water two feet deep at Del Rio and all came by El Paso.

Q. Assuming a continuous body of the river?

A. And including the tributaries below?

Q. Yes, sir; some tributaries. You would not undertake to say no water from the north reached Del Rio and Laredo?

A. I doubt if it has ever run a body of water big enough for any of it to reach Del Rio.

Q. Swear positively to that, as a matter of opinion?

A. As a matter of opinion; yes, sir.

Q. You swear to that positively?

A. That is my opinion.

Q. From your examination on that trip?

A. Yes, sir; and other trips; and that trip in particular.

797 Q. And other information you have previously had?

A. Yes, sir.

Q. Without having any particular reference to this trip, which made the idea of what became of these heavy floods?

A. I can not account for their not coming down there.

Q. You can—you never investigated above Presidio, where you started out with your boat?

A. Yes, sir.

Q. When?

A. I have been to El Paso time and again. I never seen any more water in the Rio Grande than the other day.

Q. Did you see any the other day?

A. Yes, sir; a muddy ditch there.

Q. How much water was in the river that day?

A. A plank across it, and people using it for a footbridge.

Q. Was there ever any more water than that in El Paso?

A. Yes, sir; from hearsay; not of my own knowledge.

Q. How much water has been in the river at El Paso at different times?

A. From hearsay?

Q. How much?

A. And general repute; I have heard of it overflowing the banks and flooding the lower part of town, and getting up as high as the courthouse.

Q. Heard that in the testimony in this case?

A. No, sir; I heard of it from different parties.

Q. If the water reaches from northern New Mexico to El Paso, why shouldn't it reach just as far south?

A. More of it absorbed the further it travels through loose sand.

Q. How much loose sand between El Paso and where the stream debouches from the mountains in northern New Mexico?

A. I know how much sand from the mouth of the Concho, pretty near; very near 500 miles of that, and I know that would take up a large body of water.

Q. Would you undertake to say, as a matter of opinion, that the water which had traveled from Embudo—say, being the stage of water,
798 about the same stage, relatively the same stage of water at El Paso as at Embudo, if the water came from Embudo to El Paso—would be lost within the same distance below there?

A. I think there would be more water lost in a given number of miles below El Paso than there would above.

Q. Why?

A. Because there is a greater quantity of sand and gravel in the bed of the river and it is wider generally.

Q. How do you know that?

A. From seeing it.

Q. Have you investigated the river from El Paso north?

A. Not beyond having seen the valley along here and crossed it a couple of times by rail.

Q. Going up and down the valley on the railroad, have you ever measured the width of the valley?

A. No, sir; I see from where the buildings are, how close they are to the river, that they can not ever have any very big rises.

Q. Do you know of there being washouts here in the valley of the Rio Grande and in New Mexico frequently by floods?

A. May be; it does not look reasonable people will build houses where they would be washed away every year or two.

Q. Do you know whether that is a fact or not?

A. No; I can merely judge from appearance of the valley that the valley below would absorb more water than above and between here and El Paso; I know nothing of this country above here.

Q. Your reason for thinking it is of a more absorbent character below than above El Paso is based on the fact that the houses are closer into the river?

A. There are no houses below El Paso in the valley.

Q. This country up here is more thickly settled than that is, isn't it?

A. Yes, sir; strips of country over a hundred miles long that are without a human being.

Q. No occasion for anybody to build a house very close to the river?

A. Not any occasion to build a house anywhere down there.

799 Q. No irrigation down there?

A. At Pulya some irrigation on the Mexican side, and there has been on the American side, but the ditches were washed away; there is a dam there.

Q. Is the fact that they can irrigate and raise crops any inducement for the Mexican population to build houses in close to the river?

A. I naturally suppose where they are depending on farming they would build houses near where their farms are, not out on the mountain sides.

Q. Did you ever hear of the town of Socorro being inundated and almost washed away in the last few years?

A. I can not recollect that I did.

Q. San Marcial; as I understand you, you do not mean to say that those rocky cañons are absorbent?

A. I do not think so.

Q. Where that Grand Cañon walls had fallen did not keep the water from passing?

A. I do not think it absorbs or causes the loss of a pint of water.

Q. Water got through? To what do you attribute the absorbent qualities?

A. You can stick an oar in a foot deep as you go a long, and it is quicksandy. And where you camp on a sand bar it may rain two or three inches during the night and no water in your tent in the morning. It absorbs where it falls. Does not run; have never seen a rain heavy enough to run water off those sand bars.

Q. Don't you know that this whole river is full of sand bars and quicksands from El Paso to White Rock Cañon?

A. I don't know.

Q. And the Española valley above there?

A. I don't know anything about the formation above here, and one-half the river below Presidio is pretty near half rock bottom, I should suppose, and rock sides, too.

Q. You have never, independently of your capacity as an intelligent observer, made any scientific study of this question?

800 A. No, I have got no interest in it one way or another; my only interest in the Rio Grande or use for it was to hunt and fish on it.

Q. Drink water out of it occasionally?

A. Sometimes you had to strain the water through your teeth.

Q. You do not claim any scientific knowledge?

A. No, sir; I am no water expert or water witch.

The COURT. Do you remember the circumstances of a large flood being at El Paso in 1897?

A. I know there was a flood within the last year or two; read reports of it—accounts of losses in El Paso.

Q. Do you remember where you were living at that particular time?

A. At Del Rio.

Q. You have a present recollection of being at Del Rio on the occasion when you read these accounts?

A. Yes, sir.

Q. What was the condition of the Rio Grande at Del Rio, say at that time and for ten or fifteen days thereafter, as to being in a normal condition or being flooded?

A. My recollection is it was normal condition. I looked for a rise in particular, and was surprised that no rise came from the effects of this flood that we heard of.

JAMES H. McMAHAN, a witness called on behalf of the defendants, having been first duly sworn according to law, testified as follows, to wit:

Direct examination by Judge FALL:

Q. State your name, age, residence, and occupation.

A. James H. McMahan; I live in the town of Del Rio, Texas; am 54 years old, last birthday; my occupation is carpenter by trade.

801 Q. How long have you lived in Del Rio?

A. Since the spring of 1882.

Q. How long have you known the Rio Grande River?

A. Since '82.

Q. What experience have you had upon that river and its tributaries, if any?

A. Considerable.

Q. About how many years?

A. I think my first experience on the river was in the spring of 1885.

Q. Do you follow your trade as carpenter, or do you follow some other occupation a greater part of the time?

A. I follow the carpentry trade, generally speaking, in the summer season; in winter I hunt and trap on the Rio Grande and its tributaries. Have for the last thirteen years.

Q. On what part of the Rio Grande have you spent the winter seasons or other than the summer seasons for the last 13 years?

A. From El Paso to Rio Grande City, or to Roma—near Roma, on the Rio Grande.

Q. What experience, if any, during this time have you had upon the different tributaries of the Rio Grande within that distance?

A. I have had considerable experience, sir.

Q. What are the tributaries of the Rio Grande between Roma and El Paso, which you know, coming in, we will say, first, on the Mexican side?

A. Well, I suppose I know every tributary that comes in between here and Roma, but I may not recollect at the time to call the names of all of them.

Q. Mention the names of those you can recall now.

A. I will commence with Carrizo; there is a stream there; a river comes in—I believe they call it Salado; that is the first I know. Next stream above, on the Mexican side, of anything that I recollect the same of—there is several small streams or branches come in there, but

802 I don't know anything about any of them any more than I have seen them where they enter the river. Next one is a small river below; I don't recollect the name of it. There is a river comes into the river, but I don't know the name of it, above Carrizo some 12 or 15 miles, somewheres in that country, that runs some water into the river; did when I was there. Next stream above, that I recollect of that pours any water into the river, is the little river called the San Antonio, or a little river below Eagle Pass. Next stream above there, above Eagle Pass, is San Rodriguez; it is a small river, 50 or 75 miles long; may be 100; don't know how long it is; don't know but very little about its length. Next, Santiago, a considerable stream; flows quite a lot of water on the Mexican side. Next river above there—well, I don't know whether you would call it a river or a creek—is the Las Bacas. There was no river then of any nature coming into the Rio Grande on the Mexican side until you got to the mouth of the Concho.

Q. Do you know anything about the San Juan River?

A. No, sir.

Q. Do you know the San Juan at any part?

A. No, sir.

Q. What is your knowledge of the Concho?

A. Very limited above the mouth of the Concho over 12 miles.

Q. You have never been on the head waters?

A. No, sir.

Q. And of the streams on the other side of the river between Roma and the mouth of the Concho—what are those streams, from the Texas side?

A. I don't know any streams coming in on the Texas side of the river above Roma that flow water to amount to anything until you get above Eagle Pass, and there those streams—there are several little creeks coming into the river that do not afford much water now, even for the last six years.

Q. How was it prior to the last six years?

A. There was water in those streams, some three or four of them, plenty to run a skiff.

Q. How do you know that?

A. By running skiffs at times, trapping in them.

803 Q. For the last six years have you been able to do that?

A. Haven't been able to run a skiff up any of them any distance whatever. From there the next one is Elm, above Eagle Pass; next one is Las Moras, a brisk-flowing stream when I first went down the Rio Grande River trapping; the next one is the Pinto; that was another brisk-flowing stream when I first went down there; next one then was the Sycamore; that had plenty of water in it when I first went there; next one then is the San Felipe. I cannot tell whether it has diminished any in its water or not. It is a short creek; except I know at the head of San Felipe when I first came to that country there was a bold-running

stream that furnished a considerable amount of water, which is now dry. And the next stream above that is Cienega; when I came to that country, 13 or 14 years ago, when I first commenced trapping, it was a considerable stream; afforded a great deal of water; there was beaver dams in it and plenty of beaver; now there is little or no water in it, comparatively none. Next above that is Devils River, which affords quite an amount of water and runs into the Rio Grande, and it don't furnish hardly as much water, I don't think, from the fact that I know of several bold-running springs when I first got acquainted with the river which are now dry. Next stream above Devils River is a stream that is called Good Enough; it is short stream, not over a mile from the river, is the head of it; between $\frac{3}{4}$ and a mile, not over a mile, a bold-running stream comes right out of the foot of the hill; I don't know it has ever decreased in the amount of water that flows from it. The next river is the Pecos, and when I first came to this country I camped on the Pecos three months at the mouth, when they were building the Texas & Pacific Railroad; have been on it trapping and hunting and fishing frequently since, and I cannot tell that it has diminished in its flow of water any since that time.

Q. Now, Mr. McMahan, what has been the condition in that country which you have just described during the time that you have known it with reference to humidity, rainfall, or drought?

804 A. When I came to that country I moved from San Angelo, Tom Green County, and we had generally very good seasons. First year after I came there I had stock in that country—a few stock, and it was supposed to be an extreme good seasonable country for cattle and stock generally; that was in 1882. Since that time it got more or less drought, until this year; we have had tolerably plenty of rain this year; more than we have had any time in my recollection since 1882. In the spring of 1882 and summer we had plenty of rain—tolerably plenty of rain in that country. And it got so extremely dry in that country it became useless for a small man—a man of small means—to undertake to keep stock in the country, so I sold my cattle and never did try to raise stock any more.

Q. What has been the cause of the diminution of the supply of water in these streams which you have testified about—of the diminution in the flow since the time you first knew them, or within the last six years?

A. My only cause for it was from extreme drought and for lack of rain.

Q. You have testified that you have known the Rio Grande from El Paso to Roma?

A. Yes, sir.

Q. What experience have you had actually in the Rio Grande from El Paso to Roma?

A. Well, I have once—traveled the river frequently from Presidio del Norte to Laredo as many as three trips.

Q. How?

A. With a boat in the channel of the river—down the channel of the river.

Q. Through what is known as the Great Bend?

A. Yes, sir; through the Great Bend.

Q. When did you first make the trip through the Great Bend from Presidio del Norte?

A. In 1891.

Q. Now, from El Paso down there to Presidio del Norte, what experience have you had?

A. I made one trip with a skiff—me and a couple of other men—with two small skiffs from El Paso to Presidio del Norte.

805 Q. When?

A. In 1893.

Q. How much water would that skiff, with three men, draw?

A. There was only two men—two skiffs and three men.

Q. How much water did your boats draw?

A. My boats loaded with the load I had on at no time would not draw over six inches of water.

Q. How high was the water at El Paso when you left there?

A. When I left, the water was, from my best guess, was about three feet or three and one-half foot rise.

Q. That was in 1893?

A. Yes, sir.

Q. From what point in El Paso did you leave?

A. I launched my boat at the lower bridge that crosses the river.

Q. About three to three and a half feet of water in the stream then?

A. Yes, sir.

Q. How long, if you know, had that water been flowing at El Paso?

A. I had a brother-in-law that lived in this town that I had corresponded with. I had wrote to him to know if there was water. I had been waiting to make the trip down the Rio Grande—from El Paso down—and I had understood that the river had been dry between El Paso and Presidio del Norte, and I wrote to him, and he informed me that the river was up and had been up for two or three weeks, and if I would come then I would find plenty of water to go down the river, and I fixed up and came to El Paso and found water. Made two boats in this old gentleman's shop—I have forgotten his name—on this side, close to the railroad, and put them in the river and went from there to Presidio.

Q. At what season of the year was this?

A. I left Del Rio the 25th day of December, Christmas day—left El Paso—

Q. Going down the river?

A. Yes, sir.

Q. How long did you remain in El Paso before leaving?

A. I had been in El Paso eight days.

806 Q. What was the condition of the river during that eight days?

A. The river had been up and was on a decline; I went to the river nearly every day to see how it was holding the water.

Q. And there was three to three and one-half feet, then, when you left?

A. Yes, sir.

Q. Now, state to the court what the stage of the water was as you went down the river. How fast did the water travel and how fast did you travel?

A. Well, I estimated my distance at the time as traveling on an average of about 20 miles a day. I had a good current while it was up, and my business was trapping for beaver, and I found no beaver, and I was in a hurry to get where there was beaver, where I could work, and I

found no beaver at all on the river until I got within about 40 miles of Presidio del Norte, and found a little stream that came into the river that afforded living water the year around, and there was a small bunch of beaver there, but I did not stop to catch them; somebody had been working with them and I went on; never stopped to bother with them at all. I traveled, I suppose, at the rate of about 20 miles a day; that was my estimate; I don't know accurately about that.

Q. How far, in your opinion, is it, from your estimate made on this trip—from your experience on similar trips on the water of the Rio Grande—how far is it by river from El Paso to Presidio del Norte?

A. I estimate it—from my best knowledge I traveled not less than 400 miles.

Q. What stream comes into the river, if any, now at Presidio del Norte?

A. That is at the mouth of the Concho.

Q. Then, to the best of your knowledge, it would be 400 miles at least by the river from El Paso to the mouth of the Concho or Presidio del Norte?

A. Yes; to the best of my knowledge, I guess.

Q. How many days did it take you to make the trip?

A. I was 21 days on the trip from El Paso to Presidio.

807 Q. Were you traveling every day?

A. Every day except two half days.

Q. How many hours during the day did you travel?

A. Well, I disremember; I did know positively; I had a watch with me, but I lost it on the trip; but I think I traveled from six to eight hours a day.

Q. What was the stage of the water when you reached this little beaver stream, 40 miles above the mouth of the Concho?

A. Water was getting very scarce in the river, and it was getting a very difficult matter to travel.

Q. About how much water in the channel?

A. Comparatively none—that is, for my purposes; water getting so low at various places I had to drag my skiff off the sand.

Q. What had become of the water?

A. I don't know; it had disappeared.

Q. Then, you say you made three trips down the river from the mouth of the Concho to Presidio del Norte?

A. Yes, sir.

Q. First of these was in 1891?

A. Yes, sir.

Q. What season of the year?

A. That was in the winter season; I forget whether it was in December or January when I left Presidio.

Q. What water did you go down on?

A. On the Rio Grande to the Concho—in the channel of the Rio Grande; water from the Concho in the channel of the Rio Grande.

Q. That was in the winter season of 1891; was there water in the Rio Grande north of the Concho or above the mouth of the Concho at that time?

A. When I was there was; the first season I did not see it; the first trip I went down I did not see it—the Rio Grande River above the mouth of the Concho.

Q. Did you see it the next spring?

A. Yes, sir.

Q. Was there water in it at that time?

A. There was not; that was the second trip—time I went down
808 from El Paso; there was no water; I went on down, but when I
left there was no water in the Rio Grande at all.

Q. How long did you stop at the Concho?

A. Stayed around the Concho in that country 18 days.

Q. That was in 1893?

A. Yes, sir.

Q. When you left El Paso on December 25th?

A. Then it must have been in the early part of 1894.

Q. You say you stayed at the mouth of the Concho, on this trip, about
18 days?

A. Yes, sir.

Q. What were you doing there?

A. Trapping for beaver.

Q. What was the condition of the water?

A. Dry a mile; had no rain while I was there, and had no rain but a
little mist and foggy weather on my trip from El Paso down.

Q. Now, after staying there 18 days, which would make you about 40
days out from El Paso, you left the mouth of the Concho, going down
the river?

A. Yes, sir.

Q. Now, at the time you left the mouth of the Concho going down,
was there any water in the Rio Grande north or above the mouth of the
Concho?

A. On my trip from El Paso down?

Q. Yes, sir.

A. There was not in the Rio Grande, you mean?

Q. Yes, sir.

A. There was not.

Q. Then what water did you go down on?

A. I went down on the waters of the Concho.

Q. Mr. McMahan, where, in your opinion, does the Rio Grande River
commence?

A. In my opinion, from my observation and my travels and work on
the river, I believe really that the Rio Grande commences at the mouth
of the Concho.

Q. That is as a perennial or running stream?

A. Yes, sir.

Q. Now, what was the height of the water at the mouth of the Concho
when you left there in the latter part of January or first of February,
1894?

809 A. Well, I don't know that I know; can't tell exactly the flow
of the water of the Concho, but we had plenty. It is a good-sized
stream; had plenty of it to run the skiffs without any bother or trouble.

Q. What is the distance, in your opinion, more or less, from the mouth
of the Concho to Del Rio by the windings of the river?

A. I think it not any less than 600 miles, and I always called it seven.

Q. Are you the McMahan who was with Mr. Ware on the trip down
the river this year?

A. Yes, sir; I went with Mr. Ware and Prof. Hill.

Q. Who guided this expedition down the river?

A. I did.

Q. Then, according to the best of your information, and belief and experience, from El Paso to Presidio del Norte, to the mouth of the Concho, is about 400 miles?

A. Yes, sir.

Q. From Presidio del Norte to Del Rio is not less than 600?

A. I do not think it is.

Q. It would then make it a thousand miles from El Paso to Del Rio?

A. At least.

810 (Evidence of Jas. H. McMahan, continued by E. L. Medler, stenographer.)

Q. What, in your opinion, is the distance from El Paso to the mouth of the Pecos, in round numbers?

A. Well, it is from El Paso to the mouth of the Pecos—it is between five and six hundred miles.

Q. How far above Rio Grande City—I mean Del Rio; how far above Del Rio is the mouth of the Pecos by the river?

A. It is about eighty or ninety miles.

Q. Then, from Del Rio to the mouth of the Pecos it is eighty or ninety miles, and from El Paso to Del Rio it is a thousand miles; how far would it be from El Paso to the mouth of the Pecos? I speak of El Paso now, not the Concho; from El Paso to the mouth of the Pecos?

A. From El Paso to the mouth of the Pecos it is between nine hundred and a thousand miles, the way I always estimate.

Q. Do you remember anything about the reports of a great flood in El Paso in the year 1897?

A. Yes, sir.

Q. Where were you at that time, when it was reported?

A. I was in Del Rio.

Q. In Del Rio?

A. Yes, sir.

Q. What was the condition of the river at Del Rio at the time that you heard this report, and for any time after that, if you can remember?

A. The river was low at Del Rio when the report came through that country that there was a considerable rise at El Paso. I was waiting to make a trip down the Rio Grande River at that time. I waited. I anticipated starting, about the time I heard that, on a prospecting expedition on the Rio Grande, going down with a boat. I waited a while for the rise to get through, to pass down, expecting there would be a rise. I was going then with a small skiff to the Pantillas, opposite Marathon, on the Texas Pacific Road, I with another party, and when I

811 got to the Boquillas—

Q. Is that above or below Del Rio?

A. Above Del Rio. Came up on the railroad and transferred my boat over by wagon to the Boquillas mines, and when I got there the river was up, I suppose, a foot. When I got to the Boquillas mines, probably a foot and a half. I stayed at the Boquillas five days, and the river appeared to be declining all the time. I started down the river.

Q. Declined, you say?

A. Yes, sir. I started down the river—let's see, I got there, I think it was, in the first part of June, along about the first part of January, probably between the 5th and 6th.

Q. Of June?

A. Yes, sir.

Q. At the Boquillas mines?

A. Yes, sir. When I started down the river I was on the river about eight days.

Q. Which would throw it about the 13th or 14th of June?

A. Yes, sir; it commenced raining on me. I didn't go down the river first, at that time. I was taking my time prospecting along for mineral, and when I got down in the mountains below, went through one cañon and down to the Marvillas Creek—they call it Marvillas there—it commenced raining. It rained so hard when we got just below we had to stop travelling. We couldn't even travel in our skiffs. Stopped and laid up seven days on account of the rains.

Q. That would be, then, from the 14th to the 21st or 23rd?

A. Yes, sir; and about four days before we left there the river commenced rising. The Maravillas got up very high, and other streams came in from the cañons and the water commenced flowing very high and the river rose every day until the rain stopped, and when the rain stopped we could see we could travel. The river was enormous height in those seven days we put out, and so we quit prospecting along the river, as the river was so high we couldn't prospect any more conveniently, and we went on the rise from there to Del Rio.

812 Q. How long did it take you to get to Del Rio?

A. I think five days.

Q. That would be, then, about the 28th or 29th of June?

A. Yes, sir; about the 28th or 29th of June.

Q. Where did that rise come from that you went down on?

A. I don't know; expect what I seen came into the river myself, from the Maravillas, from Eagle Cañon, and from other cañons along the river.

Q. How long was the water coming in from these cañons; how long did that continue?

A. That continued about four days—four or five days.

Q. The water was pouring in from these tributaries and cañons?

A. Yes, sir.

Q. From your experience on the Rio Grande River, and your knowledge of that river and of the bed of it and of its tributaries, based on such experience and observations for thirteen years, as you have testified to, in your opinion would a flood of water at El Paso reaching to the span of the bridge from which you launched your boat in 1893, and extending from bank to bank of the river, reach Rio Grande City, or Del Rio, even if the Concho and the other tributaries of this river to which you have testified were cut off so as to divert all the water flowing into the river from these tributaries?

A. I don't think I would ever live to see the time, if I should live a hundred years.

Q. That such a flood would ever reach those places?

A. That it would ever reach Rio Grande City.

Q. From your knowledge of this river, and of the country for a thousand miles, particularly, which you have testified to below El Paso, what, in your opinion, would be the effect upon the navigable capacity of the Rio Grande River below Rio Grande City if the defendants in this case were to impound the waters of the Rio Grande flowing beyond a point known as Elephant Buttes, or 125 miles north of El Paso, 813 so as to conserve all the waters flowing down towards that point in that stream—what would be the effect upon the navigable capacity of this Rio Grande below Rio Grande City?

A. Well, I know nothing of the waters of the Rio Grande above El Paso, but I don't think that any rise that you speak of, that would last a month or six weeks, could ever affect the Rio Grande below—specially affect navigation.

Q. You say you don't know anything about it above El Paso? Suppose you were to impound the waters at El Paso in an international or any other reservoir, or by any other dam impound the waters at El Paso, so as to stop the entire flow from this part of the Rio Grande, would such stoppage of the flow affect the navigable capacity of this river at Rio Grande City?

A. I don't think it could possibly be.

Cross-examination:

Examined by Judge BURCH: Mr. McMahan, how long did you say you had been at Del Rio?

A. I moved to Del Rio in 1882.

Q. Yes, sir; 1882?

A. March, 1882.

Q. Has the water in the Rio Grande, from your observation at Del Rio from 1888 or down to the present time, been as great as formerly?

A. No, sir; it has not.

Q. Steadily decreased in general flow?

A. Been a general decrease in the flow of water.

Q. Does that mean a steady decrease or sudden falling off?

A. I call it a steady decrease; from my observation, a gradual decrease—a general decrease—a gradual decrease.

Q. Then, do I understand you, from 1888 down to the present time it has decreased every year a little?

A. Yes, sir.

Q. Or has it decreased by sort of a sliding, inclined-plane sort of a stage?

A. It has decreased gradually, according to my observation, every year.

814 Q. That would imply, would it, from your standpoint of judgment a decline in the waters that came into the Rio Grande above Del Norte?

A. Yes, sir; well, above Del Norte I wouldn't know. I think it would be from the waters generally that flow into the river generally from there up.

Q. That is what I say—Del Rio; I mean where you reside?

A. Yes, sir.

Q. You are of the opinion, then, that each year it has dropped below the previous years?

A. Yes, sir; I am positive of that.

Q. That been a general decline in the winter as well as in the summer months?

A. Well, generally speaking, the water level is generally lower.

Q. You mean the Rio Grande at Del Rio is as low in the summer as it is in the winter?

A. In the winter, as I say, as it is in the summer, generally speaking.

Q. Is it as high generally in the winter as it is in the summer?

A. It is hardly as high in the winter as it is in the summer.

Q. Might I enquire what part of the summer you have reference to?

A. Latter part of the summer, say July and August. Generally July and August.

Q. You mean to say that these are the low months?

A. I mean to say they are generally the highest months.

Q. June, July, and August?

A. Yes, sir.

Q. Never, I suppose, in October.

A. Oh, sometimes. I knew some along as far as in October—September and October.

815 Q. It has been down there, all this while, very dry?

A. It has been very dry, sir, in our section of the country for several years.

Q. What would your section of the country imply?

A. I suppose you might consider from Eagle Pass to Marfa and Presidio counties.

Q. And that has been on right straight through?

A. Yes, sir; on as far as my knowledge.

Q. How far is this place you just mentioned—how far is that up above or east of Del Rio?

A. It is, I suppose, something like 240 miles. Marfa, you mean?

Q. Yes, sir; 240 miles up this way?

A. I think that is not far from the distance.

Q. It has certainly affected the country as to drought?

A. Yes, sir.

Q. You don't know the average rainfall—you never kept any measurements there?

A. No, sir; paid no attention to that.

Q. And I suppose they have had hardly any rains—few rains?

A. We have had frequent rains, but not enough to do the country any good.

Q. They generally come in the autumn or spring?

A. Generally come in May and June, latter part of July sometimes, and September. Sometimes in September.

Q. Not enough, however, to do vegetation any good?

A. At times we have had rains in portions of the country that done vegetation good in some places.

Q. Have they been, in your opinion, such as to diminish the volume of the water in the river?

A. I think so; yes sir.

Q. That is, the drought, the lack of rain?

A. Yes, sir.

816 Q. What are the character of your precipitation or rainfall down there in that country; generally come in sort of showers and pass away?

A. The character of our rains, generally speaking, comes in gushes and showers.

Q. Rains a short time and then clears off?

A. Sometimes we have a hard shower of rain, but, generally speaking, that is the way with all our rains in here, they are showers. We have them different sometimes for a day or two, a kind of misty rain.

Q. Never any long-continued rains?

A. No; no long-continued rains.

Q. That is, they are merely showers that come and then clear away, and you go to work again with your work?

A. In 1892 we had a rain there that lasted six or seven days.

Q. In 1892?

A. In 1897, I mean.

Q. Then the only rain you have really ever had in all those years just happened to be about the time of the El Paso rain; that was a five days' rain?

A. Never said anything of that kind.

Q. Didn't I understand in your direct examination that you said you had a five days' rain come on there?

A. Seven days' rain.

Q. And that was only a short distance above the Marathon?

A. Below.

Q. You put your boat in the river opposite Marathon?

A. Yes, sir.

Q. This dry plot you speak of is up this side of Marathon. And just on the heels of the flood at El Paso, the report you had in 1897, you had seven days' rain, and you had never seen the like of that before?

A. Never said I never saw the like before.

Q. Except in only one instance, have you seen a seven days' rain down in that section of the country?

A. Probably I have before, but I can't give you the dates just at this time.

817 Q. But you happened—

A. But it happened just exactly that way—a seven days' rain.

Q. Night and day?

A. Night and day, you might say; I was out of doors every day we camped.

Q. It rained so much, however, that it spoiled your trip?

A. Didn't spoil our trip, but spoiled the bank.

Q. You then went down to Del Rio and didn't go on the proposed prospecting trip?

A. Went on after the rain was over.

Q. How does it happen that your usual vocation is that of a carpenter, and how did it happen that you wanted to go on this prospecting trip?

A. I am liable to do most anything that there is money in.

Q. Oh, I see. You just happened to go on that particular occasion when the El Paso flood was on, and it disappointed you by raining seven days?

A. I happened along there about that time.

Q. That raised the river, didn't it?

A. That raised the river.

Q. And when that rain reached there, it rose the river; hadn't been but eighteen inches up to that time, but when the rain commenced—

A. Before the rain commenced it was a foot.

Q. How many other summer trips have you ever had on the river?

A. Well, up in that portion of the country I haven't had any.

Q. That is the first and only summer trip you have made?

A. Above Langtry, I will say.

Q. Well, now, Langtry; where is that?

A. It is seventy or eighty miles above Del Rio. That is the only summer trip that I have ever made from up in that portion of the country down the river.

818 Q. Before you came here to testify on this occasion, Mr. McMahan, did you ever have any talk with anybody about your experiences on the river, which led to your being called up here as a witness?

A. I might have probably talked to any person.

Q. Who did you talk with about it? I don't mean the attorneys in this case, but anybody down there before you came up.

A. Mr. Ware and I have talked about the case.

Q. The gentleman who testified?

A. Yes, sir.

Q. Was it he who asked you to come up?

A. No, sir.

Q. Did he propose to you to come up as a witness?

A. No, sir.

Q. Who was it, then?

A. I was notified of this by a gentleman by the name of Reed.

Q. Mr. Reed? Whereabouts did you see Mr. Reed, by the way?

A. I saw Mr. Reed in Del Rio and through the country generally.

Q. Did he ask you for your experiences up and down the river?

A. Mr. Reed asked me and I told him.

Q. Yes; and you told him about this particular seven-days' rain?

A. He knew; but he asked me, I suppose—not about this particular trip. I don't know that I mentioned that to him or to anyone else.

Q. This is the first you happen to recollect it, when you came in court here?

A. The first time I recollect of mentioning it to anybody; I might have done it, but I don't recollect it.

Q. It has escaped your recollection, if you ever mentioned it before?

A. Yes, sir.

Q. It was a great disappointment to you that that flood didn't come along?

A. I have been worse disappointed in other affairs.

819 Q. Yes; and it was a greater disappointment that the rain came on?
Mr. HAWKINS. I don't think that is a proper method of cross-examination. I submit to the court.

The COURT. I think the method of examination goes a little further than is justifiable. The object of the examination is perfectly legitimate to show the interest, if any, of the witness.

Judge BURCH. If the objection is sustained, I will proceed to another branch of the inquiry.

Mr. HAWKINS. I made no objection; I simply called the attention of the court to it.

Q. Well, we will go back to this trip, this Christmas trip that you told us about. Now, you say you went to El Paso, and there you constructed a boat or boats—one or two?

A. Two boats.

Q. You constructed two boats at El Paso, and went down clear through to Del Norte?

A. From El Paso to Del Norte, and from there to Del Rio.

Q. And when you started out there had been flood water at the rate of, or at least there had been a flood for some days, as you heard reported from your brother-in-law, and you also watched it several days?

A. Yes; yes, sir.

Q. How high was it when you first struck the river at El Paso?

A. Don't know that it was any higher when I struck it than what it was when I left. There was little, if any, difference in it.

Q. Kept up a steady flow, or near to it?

A. Yes, sir; or near to it.

Q. And you started down on about three and a half feet of water?

A. About three—three to three and a half foot rise.

Q. You only traveled twenty miles a day?

A. That is what I estimate my travel was.

Q. When there is a three or three-and-a-half foot rise on the river, what is your experience in regard to the rapidity of the current?

A. Well, take the Rio Grande in places, when there is a three-
820 foot rise, it is very rapid.

Q. Well, I will put it in a different way. From El Paso what would be your experience at that time—I mean on that three-and-a-half foot rise?

A. From El Paso down as far as I have been, I suppose—

Q. I will put it in just another form. What, in your opinion, was the rapidity of the current at that time, at the time you started to go down?

A. Well, I say it is at different places.

Q. Well, when you first started out?

A. When I first started out? I think we had a pretty smooth river, but not a very fast current until we got quite a ways down the river.

Q. Was there other persons with you?

A. Two other persons with me.

Q. What were their names?

A. James McMahan, a nephew of mine, and another man, William Carr.

Q. Did you use oars or float?

A. Used oars altogether.

Q. And by the sinuosities of the stream, as they term it, by the regular channel of the stream, you think you went twenty miles a day?

A. We went on an average of twenty miles.

Q. That is what I mean; on an average of twenty miles a day?

A. That is my estimate.

Q. And how fast would you think the current went; I mean in twenty-four hours?

A. Never had much experience in measuring the rate of current of a river; never paid much attention to it. A fellow travels faster according to the way he goes, and I have travelled foot, horseback, and in wagon, and I would travel sometimes four miles an hour, and sometimes three, and sometimes two, and sometimes it was as high as six. I don't know how fast I was travelling every hour.

821 Q. But, Mr. McMahan, it wasn't your travelling that I wanted, but the travel of the water I wanted?

A. I don't know; I might have travelled by water at any time, and might not have travelled this way. I estimate it at the rate of twenty miles a day. I never change it. I don't propose to change it.

Q. No; I don't want you to change it. I want to find out about the current.

A. I wasn't interested in the current in any particular, and I don't know that I know anything about the rates of the current, taking it as a general thing.

Q. You have travelled up and down the river, of course, a good deal?

A. Yes.

Q. And you have had a good deal of observation of the current?

A. The usual.

Q. You have testified to some very important facts here in regard to this. I wish to find out, what in your judgment, was the average current of that river for the twenty-one days that you say you were in going down the river, the number of miles the current made in twenty-four hours—that is, taking the twenty-four hours each day as the average, how far did the water, in your opinion or your judgment, travel in twenty-four hours?

A. I don't believe that the water, taking it on an average, of the Rio Grande—that that stage of water—from time I went on it, taking it on the high stage, that it was averaging exceeding two miles an hour.

Q. Then do you believe it did travel that fast?

A. Oh, I can't tell. I might believe it did, or I might believe it didn't.

Q. What would be your best judgment?

A. I would believe that it didn't; I don't believe that it exceeded over two miles an hour. I hardly think it went that fast.

Q. What is the least point you would put it at, now, Mr. McMahan, if you don't think it went two miles an hour?

822 A. I don't know as I care to state anything except what I know.

Q. I ask you for your judgment. I don't want you to give anything more than your best judgment as to the rapidity of the current.

A. If my judgment is worth anything to you, I might say I thought that it did.

Q. Travel two miles an hour? Well, you were traveling an average of twenty miles a day; the current of the stream would be traveling forty-eight miles a day, and you would then be going less than half?

A. I never said I travelled—

Q. Your best judgment was that you travelled twenty miles a day. Is it not so?

A. Never figured on it.

Q. I think you estimated the distance and all in your direct examination.

A. I said I imagined and estimated.

Q. Might it not have been that, being on a falling river at Christmas time, when you started, that the river got ahead?

A. Might have got ahead, and might and might not.

Q. But it is your judgment that the current run ahead of you, or the river disappeared?

A. I think it disappeared; it might have run ahead of me—some of it.

Q. Do you think it disappeared?

A. I think it disappeared.

Q. What is your reason?

A. Because I can't see. On the occasion it appeared to me that I travelled along with the current, and I could see of a night when I would camp that the water diminished on the banks, perhaps. I would land the boat on the land, and next morning it would be on dry ground.

Q. And you would push on and the river kept going down on you, and finally it got dry. You never have seen it dry up in the winter season?

823 A. No, sir; I haven't seen it dry.

Q. Don't you know, as a matter of fact, that it often does go dry?

A. No, sir; I don't know it as a matter of fact.

Q. It was dry above the mouth of the Concho?

A. It was one time.

Q. Only one time?

A. One time when I was there; yes, twice when I was there—the second and third time I was there.

Q. It was dry; and these were at what seasons of the year?

A. That was in 1894 and 1899.

Q. That is the year?

A. Yes, sir.

Q. And in 1894 it was dry?

A. Yes, sir.

Q. Did you hear the testimony of a gentleman here by the name of Doctor Hadley, in the court room the other evening?

A. I believe I heard most of it; some of it I did not.

Q. This powerful rain of seven days in duration which caused the rise in the river, was in what year, now?

A. That was in 1897.

Q. In 1897?

A. Yes, sir; that I spoke of.

Q. The seven days' rain?

A. Yes, sir; in 1897.

Q. Did you ever experience any such rains in 1891, 1892, 1893, and 1894?

A. Well, I don't know that I ever did any more, while I never noticed it as many as I did, for I had occasion to notice that particularly, because I was badly in it. I was in it in the summer season, with very little protection.

Judge BURCH. That is all.

Redirect examination, JAS. McMAHAN:

Examined by Judge A. B. FALL: Do you know Mr. Samuel Armstrong?

A. Yes, sir; I have known him.

824 Q. Have you known him since you been here?

A. I think I saw him in the room.

Q. Where did you first know him?

A. In Del Rio, in Val Verde County.

Q. When was that?

A. I think my first acquaintance with Mr. Armstrong was about four years ago.

Q. How did you become acquainted with him?

A. Four or five; it seems to me that it was about four years ago.

Q. How did you become acquainted with him?

A. I was in the fishing business at Del Rio, on the Rio Grande River. Mr. Armstrong came into the country, and came to me for knowledge of the fishing business, and proposed to go in and work with me, and did so.

Q. How long did you work together?

A. I disremember the length of time, but it appears to me like—something like three months.

Q. During the time when you and Mr. Armstrong were working together, about four years ago, was there a flood, that you have any reason to remember, in the Rio Grande River?

A. There was.

Q. Where was that?

A. Opposite the town of Del Rio.

Q. How high did the water rise at that time?

A. I think I estimated it at twelve feet; it might have been more or less.

Q. Where did that flood come from?

A. I do not know.

Q. You say you estimated it at about twelve feet?

A. It might have been, more or less.

Q. What reason, if any, have you to remember that particular flood?

A. Because I was fishing on the river, and had nets and boats, and was right in the river and fishing at the time.

825 Q. How long was the river in rising?

A. It appears to me like the river rose two or three feet, and remained that way for probably a night and a day, and then all at once it came down in a couple or two or three hours, and rose to a height, in not over five hours, of at least twelve feet.

Judge FALL. That is all.

SAMUEL ARMSTRONG, being called as a witness on behalf of the defendants, and being duly sworn to testify the truth, the whole truth, etc., on being questioned by Judge A. B. Fall, said:

On direct examination:

Q. State your name, age, and residence.

A. Samuel Armstrong; 54 years of age; live at Las Cruces, Dona Ana County, New Mexico.

Q. How long have you lived at Las Cruces, or in this vicinity?

A. Came here first in 1881.

Q. Do you know Mr. McMahan?

A. Yes, sir.

Q. Where did you first know him?

A. I got acquainted with him at Del Rio, Texas.

Q. When was that?

A. That was in February, 1895.

Q. What were you doing when you became acquainted with him, if anything?

A. We were fishing there together; fishing together there out of the Rio Grande River.

Q. How long were you on the river at that time?

A. Why, I think we were together about three months; I was there nearly two years.

Q. At the time you were fishing with Mr. McMahan, or during
826 that time, did you have reason to know of any flood in the river?

A. Yes, sir.

Q. When?

A. It was the last of May; on the 19th day of May, I think.

Q. What year was that?

A. 1895.

Q. Do you know where that flood came from?

A. Yes, sir.

Q. Where?

A. Came from Devil's River.

Q. What was the height of the flood where you were?

A. In Devil's River it was a twenty-foot rise, and from 12 to 14 feet in the Rio Grande.

Q. Do you know whether or not any of the flood came from north of Devil's River, up the Rio Grande from Devil's River?

A. I do.

Q. How do you know?

A. I had a man on the Southern Pacific Railroad keep me posted.

Q. How was it that you happened to keep posted?

A. I didn't want to lose my nets, and I got the train men to notify me when there was a rise above.

Q. And you say that you know that this rise did not come from above Devil's River?

A. No, sir; that didn't.

Q. 20 feet in Devil's River, and 12 feet in the Rio Grande?

A. 12 or 14; yes, sir.

Q. How long did it last?

A. It came by the afternoon with a big rise, and fell 9 feet that night—went down 9 feet.

Q. Mr. Armstrong, you say you came here to this place in 1881?

A. Yes, sir.

Q. Where have you lived since that time?

A. Well, I left here in 1892, and went to Arkansas, and from there to south Texas, and came back here two years ago.

827 Q. How much experience have you had on the Rio Grande River?

A. Twelve years here, nearly all the time on this river, until it went dry.

Q. When was that?

A. In 1888.

Q. How do you know it went dry in 1888?

A. I was fishing here then; shipped fish out of this river.

Q. Have any particular reason to know that it went dry in 1888?

A. Had a team and there was holes left above here, and when we got all there was above here, between here and Rincon, went about 100 miles below El Paso. Had to dig for water for our teams.

Q. Where did you dig?

A. Right in the river bed.

Q. From your knowledge of the bed of the river, digging in it, fishing in it, and otherwise, here at this place, below El Paso, and at Del Rio, and other parts of the river below here, what, in your opinion, would be the effect of impounding at a point 125 miles above El Paso, all the waters of the river flowing by that point, upon the navigable capacity of the river from Del Rio or Rio Grande City?

A. I don't think it would have any effect at all.

Q. What, in your opinion, from such knowledge of the river, would be the effect at Del Rio, or Rio Grande City, of a flood at El Paso, in the town of El Paso and beyond the court-house in El Paso, what would be the effect of that flood at Del Rio or Rio Grande City; that is, if the tributaries below the Concho and San Juan were cut off entirely?

A. Don't think you would see any of it, scarcely, down there.

Judge FALL. That is all.

Judge BURCH. No cross-examination.

828 R. C. DALY, another witness on behalf of the defendants, having been duly sworn to testify the truth, etc., on being examined by Judge A. B. Fall, testified as follows:

On direct examination:

Judge FALL. Please state your name, age, residence, and occupation.

A. Am sixty-seven years of age.

Q. Where do you live?

A. Live in Presidio, Presidio County, Texas.

Q. And what is your occupation?

A. I am a teacher in the public school.

Q. How long have you lived at Presidio?

A. Thirty-three years. I came over in 1866.

Q. How far is that from where the San Juan River empties into the Rio Grande, if you know?

A. I don't know.

Q. How far is it from where the Concho empties into the Rio Grande?

A. Concho empties right there.

Q. From which side does the Concho empty?

A. Runs from the State of Chihuahua, Mexico.

Q. Comes in from the Mexican side?

A. Yes, sir.

Q. Do you know anything about the Conchos River above its mouth?

A. I have been up on the Concho twenty miles by horseback. I have been up some 180 miles by carriage, on the road, but not by the river.

Q. 180 miles up the Concho, toward what point?

A. Santa Rosalia.

829 Q. What is the character of the Concho River now? What kind of a stream is it?

A. It is very, very small.

Q. What has been the character of the river in the past?

A. Well, the Concho River holds, I suppose, about its own, and probably hasn't diminished, though this year it has less water into than I have ever seen it.

Q. Do you know any of the tributaries of the Concho?

A. The San Pedro—it comes in above Cuchillo Parado.

Q. Do you know anything about the Santa Cruz on the Concho River up towards Santa Rosalia, is there not?

A. Yes, sir.

Q. Do you refer to Santa Rosalia Hot Springs and the town of Santa Rosalia?

A. That is the place.

Q. Have you had any occasion during the last thirty-three years, since 1866, to observe the flow of the Rio Grande River?

A. Yes, sir.

Q. Have you also during that time had occasion to observe, or observed the flow of the Concho?

A. Yes, sir.

Q. I will ask you first if you can state what has been the condition in that section of the country in and around Presidio, or opposite there in Mexico, for any distance over which you have known, or in Texas up from the river as far as you have known, during the thirty-three years which you have lived there, with reference to rainfall and drouth?

A. For the last eleven years the drouth is bad. We have had less rainfall—has become more and more.

Q. For the last eleven years—you have lived there thirty-three years?

A. Right in that neighborhood.

Q. Do you mean that it has simply been less for the last eleven
830 years than for a similar period before?

A. Why, for the entire period.

Q. Of the thirty-three, for the last eleven years, it has been growing less and less?

A. Less every year.

Q. How about the flow of the tributaries of the Rio Grande in that neighborhood, including the Concho and its tributaries; have the flow of these rivers, either the perennial or the regular flow or the flood flows, increased or decreased during the last thirty-three years?

A. Well, as I said before, the Concho River holds its own when it is flowing naturally. But in 1882 there was an extraordinary flood in the Rio Concho, and in 1897 there was another flood that was still greater than the one in 1882.

Q. But what I mean is, do the rivers there or the tributaries of these streams—have they held their own since this drouth set in?

A. They have not, the tributaries there.

Q. None except the Concho. That is all you know about?

A. Except Cibolo Creek. It comes in on the Texas side; it is a flood creek.

Q. Now, you said something of the great flood in 1897; when was that?

A. In August, September, and later.

Q. Now, did you during the year 1897 hear anything of a flood at El Paso?

A. Yes, sir.

Q. How did you hear of it?

A. There were telegrams sent from El Paso to our people in May, saying that there was a great flood at El Paso, and for us to be on our guard against it.

Q. Be on your guard?

A. Yes, sir.

Q. You were then at Presidio?

A. Yes, sir.

Q. Did that flood reach Presidio?

831 A. To a certain extent, but very small.

Q. How great was it?

A. At our place we could always cross the river below the Concho by foot, horseback, or carriage, except when the floods are. It took away our crossing; took away about eight or ten days.

Q. That is, you mean you couldn't cross here, as you had been, for about eight or ten days?

A. But that wasn't any great amount of water.

Q. About how much water was it?

A. Well, I suppose it would get up, or that it would cover the bottom of a carriage.

Q. Did all that water come from above the Concho?

A. Yes, sir.

Q. Concho was not flowing at that time?

A. The Concho always flows.

Q. Then, this crossing was below the Concho, or above?

A. Below.

Q. Part of that water was coming from the Concho, regular flow of water from the Concho?

A. Yes, sir.

Q. You mean to say that the Concho was not up at that time, but was just giving its usual flow?

A. Yes, sir.

Q. And at the usual flow of the Concho and the Rio Grande you could cross this river, and after this flood came down the river it would have come up to the bottom of a buggy, as I understand it?

A. After the river had gone down, then it would be to the top of the carriage or ambulance. But after it had gone again it might come up to the bottom, but not high after it went down.

Q. Not very high when it went down?

A. About enough to cover the top of an ordinary ambulance.

Q. That was all the water that reached there?

832 A. That is all the water.

Q. Were there any rains in the neighborhood at that time?

A. I don't think there was, because that is not the rainy season.

Q. And you remember there were no rains? Now, when did you say this flood from the Concho came down?

A. August.

Q. Of that year. What was the height of the water in the Rio Grande at that time?

A. There was no water in the Rio Grande.

Q. After the flood came in it, was there any water in it?

A. When the Concho comes down under flood, then it backs the water up into the Rio Grande for five, six, or seven miles.

Q. What was the depth of the water there during this flood of the Concho, at this crossing?

A. At my house, which is right on the bank of the river and half a mile below the crossing, it must have been from seventeen to eighteen feet, because it was getting into my house—that was the flood from the Concho.

Q. How did that flood from the Concho compare with this flood that came down there in May or June, of the Rio Grande?

A. Don't know; that came down from the Rio Grande was nothing to compare with the Rio Concho; the Concho flood in the last of August was about seventeen feet deep.

Q. How about this crossing?

A. That was washed out entirely.

Q. How deep was it—more or less?

A. I suppose seventeen feet.

Q. Well, you say that the El Paso flood, which you heard about, and went to look at, was a mere nothing as compared with the Concho flood of the same year?

A. Mere nothing.

Q. Do you know Mr. Reed, the engineer?

A. Yes, sir.

Q. Did you see him before you came up here?

A. Yes, sir.

833 Q. Did you have any business with him at or near the mouth of the Concho?

A. Yes, sir.

Q. Do you know what the high-water mark is on the banks of the Rio Grande above the mouth of the Concho?

A. From four to six feet.

Q. You know where it is?

A. I was there on the ground with Mr. Reed, when he was measuring it.

Q. You know of your own knowledge where the high-water mark is?

A. No, not the high-water mark—the bank of the river.

Q. The bank of the river; you know where that is?

A. Yes, sir.

Q. You know where the high-water mark is?

A. Yes, sir.

Q. Did you point out any point or direct Mr. Reed's attention to any high-water marks there, either above or below the mouth of the Concho?

A. That was below the mouth of the Concho?

Q. You know that that was the high-water mark that his attention was directed to?

A. I think that one of the Mexicans told us where he threw the stone, to indicate where the high-water mark of the Rio Grande was, but he was telling the truth.

Q. Who set the instruments there; was there any measurements taken?

A. Yes, sir.

Q. Who set the instruments?

A. I was using the rod, but Mr. Reed was using the instrument.

Q. Then the Mexican pointed it out, and you, from your knowledge, coincided with the Mexicans as to this being the proper point of high-water mark?

A. Yes, sir.

Q. Was that the highest water mark which came down the Rio Grande, which showed on the Rio Grande?

A. I think it never got beyond that.

Q. And you have known it for thirty-three years?

A. Yes, sir.

Q. And that was at a point near the mouth of the Concho?

A. Below; about a mile and a half—maybe two miles.

Q. Did you see any measurements taken in the Rio Grande above the mouth of the Concho; were you present when the Mexican pointed out the marks to Mr. Reed at that time?

A. Yes, sir.

Q. Do you agree with these Mexicans in their judgment?

A. Yes, sir.

Q. What is the capacity of this dry stream, this Cibola Creek, in flood times?

A. Well, it comes down very—brings down a very large amount of water for the time, but only runs for a day or two.

Q. How does it compare with the Concho?

A. Not anywhere near as large as the Concho?

Q. That is during flood time?

A. Yes, sir.

Cross-examination.

Examined by Judge M. C. BURCH. Mr. Daly, have you lived all the while in that one place?

A. I came to the place in 1866. In 1868 I crossed to the other side of the river, which would be in the immediate neighborhood, within a mile and a half. In 1890 I went to the Serritos mines over there and worked, maybe, eight or ten months. In 1891 I went—

Q. How far away?

A. I suppose about 120 miles. I left my home in February and returned in November, but I was back home in June and July for a month. And in 1892 I left the town of Presidio and went to
835 live on my ranch six miles from there. I was there two or three years. In 1895 I went to work for the Santa Carlos Coal Co., which is up in front of Valentines.

Q. How far would that be away? I don't know Valentines.

A. I would suppose that the mines was between 90 and 100 miles from my home; pretty close to the river; probably ten or twelve miles from the river.

Q. Now, I understand you to say that this high-water mark you speak of, at the time of the 1897 flood, was as high as the river ever gets from waters coming north of the Concho; was that correct?

A. You refer to waters coming down the Rio Grande; that is about its height.

Q. In all these thirty-three years?

A. I suppose so; there may have been a little more. That is the general run of it.

Q. Then, substantially, for the past thirty-three years you don't remember any occasion when it got any higher than this high-water mark that you observed in the flood of 1897?

A. I don't think I do.

Q. High as it ever gets—ever been accustomed to get?

A. I think that is about it.

Q. How wide is the river there at the point? I mean at the point you speak of, by your home—how wide?

A. From my house to the opposite bank, according to Mr. Reed's measurements, I think it is twenty-eight hundred feet. Nearly half a mile wide; but that takes in everything.

Q. That takes in sand bars, little canals, and everything else that is in it. But when the river rises that high I suppose it sweeps over that surface, all that twenty-eight hundred feet?

A. All of it.

Q. Then it is nearly half a mile wide there?

A. Yes, sir.

836 Q. Then, really, when water is at high-water mark from the northern flood the river is so wide there that it must be narrower in some other places that you know along there—that you know of—that is, the river isn't all as broad as that, 2,800 feet?

A. Take, for instance, not at the present time, the water that is running now in the Rio Grande is not more than 100 feet wide and probably knee deep.

Q. That is undoubtedly correct; but what I want to find out, or wanted to find out, was as to any narrower places than the banks, the extreme banks of the river down in that county. Is it all as wide as that—2,800 feet wide; the' have narrower than that?

A. Yes, sir; certainly.

Q. Now, in 1897, when this flood came along, you say it didn't get any higher than about how many feet, you say?

A. Which flood do you refer to?

Q. I mean the flood that you supposed to be from El Paso, that came along contemporaneously with the reports; how high did that get?

A. About cover the body of an ordinary ambulance.

Q. Will you illustrate from the floor up; about that high—from four to four and a half feet—five feet?

A. Oh, no; not five feet.

Q. Well, four and a half?

A. Some little more or some less. Probably four feet would cover any ordinary ambulance.

Q. Well, now, how long did it keep it at that stage?

A. About eight or ten days.

Q. Only eight or ten days, do you think, at that stage? How long did it keep up three feet; I suppose it gradually falls?

A. All go down at once—common thing—goes down rapidly.

Q. How long did it keep up at the three-foot stage?

A. That I don't know.

837 Q. About how long; can't you tell me?

A. Can't tell you.

Q. You are close observer; you have been there thirty-three years; can't you tell me about how long a flood of that kind is in running down?

A. Well, I will explain that, so you can catch hold of it. As far as I know now, when the river flood, the Concho—where the flood comes into the Concho—where the main road goes through, that is the deepest channel we have there, and now at the present time the water comes down there would be probably sixty or seventy feet wide and not more than knee-deep, and when the Rio Grande comes down that way, as I have already said, it would flood out—throw out into that deep channel, and all the other little channels would be stopped up—all the water would go into that channel. That would make the height of the river, of the water, to be about four or five feet—anyway, the height of the ambulance—but outside of that channel there might be a little bit of a channel probably eight or ten feet wide and running a stream two or three inches deep that might come on down for half a mile and disappear altogether.

Q. I don't believe I comprehend you; I don't think I do.

A. Below where the Concho comes into the Rio Grande, at the present time there is a deep channel; not a deep channel, but it is the deepest there at the present time—

Q. Is that the place where you measured?

A. No, sir; above that.

Q. The place where you measured is what I want to know; at the place where you measured, I understand it was at the height of an ambulance body?

A. Oh, no; that wasn't more than knee-deep.

Q. During the El Paso flood?

A. Don't know anything about that of the El Paso flood, because where we measured is not at the crossing.

838 Q. You don't know anything about that place where you measured or how deep it was at the El Paso flood?

A. Couldn't tell you.

Q. Now, you say that is twenty-eight hundred feet broad from bank to bank?

A. Yes, sir.

Q. Now, when the flood come from El Paso, or at least from above—wherever it did come from—how deep do you mean to say that that was?

A. That wouldn't get out of the channel that Mr. Reed and I crossed and measured.

Q. You don't think that was over 100 feet broad?

A. I don't think it was over 100, and maybe as much as 200.

Q. Did you see it at that time?

A. At the time of the flood you speak of? No, sir.

Q. Now, 'long about that time you had pretty dry *whether* down there, didn't you?

A. For eleven years past.

Q. Very dry weather—no rains that you have heard of down in that vicinity—drought been considerable?

A. No rains like formerly.

Q. Not very considerable rains?

A. Well, I will explain that, if you wish. When I came to the county the rains at that time extended over a space of probably 150 or 200 miles. For instance, I would leave Del Norte and go to Chihuahua. I might run right through a rain storm, and the rain storm would be for that distance, as much as 120 miles.

Q. You mean shower?

A. Rather a long-continued rain—a dozen little showers, one here and one there.

Q. You might go from your home to Chihuahua—all the way—through the rain formerly?

A. I might go from my home to Jiménez, which is 120 or 125 miles, and I would have the effect of the heavy rain the whole distance; 839 not through the rain storm, but that whole 120 miles would be wet ground, where it had rained.

Q. Yes; that would depend, I suppose, upon the length of the storm and the rain—whether it was a shower or whether a long rain?

A. It would take me three days.

Q. You are speaking about the visible effects of the rain. I am speaking about the rain itself. Now, will you tell me again whether you are speaking of the rain that you would go through from your home to this place—120 miles—or the effect of that rain?

A. The wet ground.

Q. Now, what I want to get at is the length of the rains—the character of the rains—whether there has been of late years showers, or what?

A. Simply showers.

Q. How far are you above Del Rio?

A. I don't know.

Q. How far are you above the mines that one of the witnesses spoke of here a while ago?

A. By the river? I don't know.

Q. By direct line?

A. About 45 miles. If I go to my home, I would go to Marfa; from Marfa I would take the train to go to Marthon, which is the shipping point into the river. That is 60 miles from Marfa.

Q. You don't go direct that way. That wouldn't be by the route as the bird flies to this place—to these mines?

A. I would have to travel north.

Q. Now, in your opinion, how far would it be up from the mines to your place?

A. The Boquillas?

Q. How far would it be from the Boquillas to your place?

A. I don't know. I suppose it would be by the way a bird flies—a straight line—eighty or ninety miles.

840 Q. Did you ever hear of a seven days' rain down there—seven days' rain two years ago?

A. No, sir.

Q. Did you at the time of the El Paso flood experience any seven days' rain or for any duration whatever?

A. No, sir.

Q. Don't know anything about any such time?

A. No, sir.

Q. You feel sure of that?

A. I am sure of it.

Q. No powerful rain came along about that time of the El Paso flood?

A. My idea of the matter, in regard to what I observed, there has been nothing for the last eleven years at our place but showers, simply showers. Rained here and one here and another over there.

Q. That is for the last eleven years?

A. Yes, sir.

Judge BURCH. That is all.

Redirect examination of R. C. DALY:

Examined by Judge A. B. FALL: You know anything about any rains down there below you on the river in 1893 or January, 1894—there down below Presidio?

A. No, sir.

Q. Do you know anything about any rains down where Eagle Cañon is? You know where Eagle Cañon is, down the river?

A. No, sir.

Q. You know where the Boquilla mines are?

A. Never been in there.

Q. Know anything about the country below there?

A. No, sir.

Q. You say that is in a direct line, as the crow flies, about ninety miles?

A. I think so.

Q. You don't know where the Eagle Cañon is, eighty or ninety miles below you?

A. No, sir.

841 Q. You don't know whether there were any rains in 1897 on the river or around Eagle Cañon—wasn't any heavy rains at your place or 100 miles or more above Eagle Cañon?

A. No, sir.

Judge FALL. That is all.

H. M. MORELAND, another witness on behalf of the defendants, being called and duly sworn to testify the truth, the whole truth, etc., on being examined by Mr. Hawkins, said:

On direct examination:

Q. Please state your name, age, residence, and occupation.

A. H. M. Moreland; 44 years of age; Marfa, Presidio County, Texas.

Q. Are you acquainted with the Rio Grande River below El Paso? If so, how long have you known the same?

A. Well, over the river on our country for about a hundred and twenty or thirty miles I am pretty well acquainted with it and have been since about 1883.

Q. How far down does your knowledge of the river extend?

A. I have been on the river as far as Brownsville, but from Pulvo to Candelaria—that is about from one end of our county to the other—where there is any towns, I am pretty well acquainted with it.

Q. How long have you known the Rio Grande River between those points?

THE RIO GRANDE DAN AND IRRIGATION CO. ET AL.

A. Well, as I say, ever since 1883, but very well since 1885, as I have been a deputy sheriff nearly all the time, with the exception of the two or three years that I was a justice of the peace.

Q. What has been the general character of the river between the points where you have known the same during the period which you have named as to flow of water, or droughts, floods, etc.

842 A. Well, from—at Pulvo during the last three or four years they have had quite a little water. They used to formerly take out a large ditch out of Pulvo, and there were farms on both sides of the river up to Presidio; but I don't think they have done any farming near Pulvo during the last four years on account of the scarcity of the water; no water in and above there, from Presidio on up to Pílares; that is, about 20 miles above Candelaria, there was no water in the river. I walked across it several times during March, April, and May of this year. During these months I was at the springs on the other side and bought most of my stuff on that side and went across.

Q. Have you had any opportunity to observe the capacity of that river to absorb flood passing down its course for any considerable distance?

A. Well, not a great deal. I think it was the 6th of May, I wanted to go camping down at the spring. In making the trip to these springs we hired our horses to go down there, and when we got down there we sent them back as it was too expensive to keep them four or five weeks, and in coming back I walked from the springs over to this side and got a man to come over with his wagon from Candelaria. He didn't come the next day, not until day after. I asked him the reason and he says, Why, the river was up so that he couldn't cross it, and when we crossed the next day there wasn't any water in there. That came from what is called Capote, about two miles from Candelaria above, and that day they had a heavy rain in there for three or four hours. We could see the clouds from where we were, and that rained into the Rio Grande, and I suppose ran seven or eight miles. When we came down we didn't cross at Candelaria but came down to a little place near a mill, probably eight or ten miles. Walked across there the next day and he said it was up to the hubs of his wagon when he went across.

Q. Did you see the flood in the Rio Grande?

A. I say it at Candelaria.

843 Q. Did it pass where you were stopping?

A. We were camped—we were camped right opposite. He said it came on two miles above.

Q. How long did it flow past the point where you were?

A. About 5 o'clock in the evening he said it came down, and the next morning it was, I suppose, a foot deep. He said he was afraid to cross that evening at 5 o'clock. Left it so big that we came down on the other side below, eight miles below there.

Q. When did you cross—how soon after you had se'n the water in the stream?

A. Must have crossed the river about eleven o'clock in the morning, and I expect it was four o'clock in the evening before that I saw the water, perhaps twelve or fifteen hours.

Q. And it had all disappeared before it got to that point?

A. Yes, sir; we walked across it; had a heavy load.

Q. How far did it run below the point where it passed you?

A. I should judge, perhaps, five or six miles. We came down about eight or ten miles, I guess.

Q. What hour did it pass you on the river?

A. It was about five o'clock when I saw it.

Q. It had run from 5 o'clock then all night until you had seen it next morning?

A. No; that I don't know, that it had run all right. I saw it at 5 o'clock in the evening, and we crossed the next morning. It was about knee high at the crossing the next morning. The water had disappeared entirely where we crossed.

Q. When did the rain fall in the Capote?

A. I think it was about 12 o'clock from the looks of the clouds, on May 5th, I think, or the 4th. It was on the 4th, because we left there on the 6th, and he couldn't cross on the 5th.

Q. Taking the general character of the Rio Grande, as you have known it there, from period to period, divide it up into periods and
844 years, and state whether its general character for the last period has been practically the same or different from its general character in the first periods, as to drouths, floods, etc.

A. Well, I don't think there is near the water in the Rio Grande the last few years as there was when I first went there. I think there is hardly a month that I wouldn't be on the river—probably three or four months and sometimes three or four weeks at a time. Very often used to do collecting for the sheriff's office—go as far as—we had to go to Candelaria.

Q. Has there been any change in the climate of that country within any period in your memory; and if so, when did such change set in?

A. You mean in heat or cold?

Q. Moisture.

A. It has been very dry, of course, in our county.

Q. Since what time?

A. Mostly for the last seven or eight years—ten probably. This year a great many of our stockmen have moved their stock off. One of them has moved close to this place here, at Anthony. Two or three have moved up close to El Paso.

Q. What effect has that drought had upon the vegetation of the country?

A. Well, of course it has had considerable effect on the growth of vegetation in our country—

Q. I mean grass?

A. No grass at all this year, scarcely. Very little, such that people have moved their stock out of the country.

Q. Has the grass been gradually failing for that period?

A. Yes, sir.

Cross-examination, H. K. MORELAND:

Examined by Judge BURCH. How long did it rain that day, probably, Mr. Moreland?

A. The rain didn't strike us.

845 Q. But from your observation of the clouds?

A. I don't think it rained more than a few hours; don't suppose it rained over a narrow strip.

Q. You only saw the water and know from that?

A. Yes, sir; there are mountains on each side and valleys where this Capote Creek is. There is considerable water back in the mountains about eight miles from the river, but it sinks before it gets to the river.

Judge BURCH. That is all.

And now, at this the hour of 5 o'clock p. m. of the 16th of December, an adjournment of the hearing of this cause is taken until to-morrow at 9.30 a. m., the same being Saturday, the 17th of December.

And now, on this the 17th day of December, 1899, pursuant to adjournment, the further hearing and trial of this cause is resumed.

Present. As before.

J. H. McMAHAN (recalled):

J. H. McMahan, a witness for the defendants, having testified on the previous day, at the request of the Government, was recalled for further cross-examination, and being questioned by Judge M. C. Burch, said:

Q. On this summer trip of yours down the river, as I recollect, you transported your boat from Del Rio up to Marathon. Did I understand correctly?

A. Yes, sir; that is correct.

Q. What year or what date was it that you transported the boat up there to Marathon from Del Rio—what year, first, please?

846 A. That was in 1897. I think it was about the first of June that I transported my boat.

Q. About the first of June; did it by the railroad?

A. Yes, sir; I think that is the date, if I am not mistaken.

Q. You certainly didn't bring it up by team?

Judge FALL. He said the "date."

Judge BURCH. Oh, the date. Did it come on a freight train, or did you succeed in getting it on the passenger train?

A. On the freight train. At least, put it on the depot for transportation. I never saw it go until when I got to Marathon myself it was there.

Q. You billed it in your own name—shipped it?

A. Yes, sir.

Q. And when you got to Marathon it was there?

A. Yes, sir.

Q. What day did you ship it, now?

A. Well, I say I disremember exactly the date, but I think it was about the first of June, maybe. Maybe a little before and maybe a little later.

Q. How soon after that did you go yourself?

A. I went about the same time. I think it was about the same time; not far from the same dates.

Q. Have you any memorandum or anything which would show you exactly what time you went?

A. No, sir; I kept no memorandum of the time at all.

Q. How much did it cost you to ship your boat up there?

A. I don't recollect that even; no, I don't recollect.

Q. How did you transport it from where it was to the freight house?

A. I hired it hauled there by a wagon. Where you mean, at home?

Q. Yes; at home. Do you know the man who hauled it?

A. No, sir; don't recollect.

Q. Can't recall his name?

A. No. I don't recollect.

847 Q. Did you go along with it up to the depot?

A. I did. It appears to me that I hired it hauled from the river.

Q. Did the person who hauled it—

A. It appears to me that I hired a Mexican man with a team to haul it. I am not certain; yes; I am sure of it.

Q. Do you remember his name?

A. No, sir.

Q. You remember what kind of a team he had?

A. No; I don't recollect. I have frequently had my boat transported from one place to another that way. I don't recollect that particular time.

Q. You shipped it to Marathon and then went by rail to Marathon; how far is that from Del Rio, about?

A. About a hundred—I don't know, but it appears to me like a hundred and eighty miles, I think. I am not certain. I don't know that I know the distance at all.

Q. When you got to Maraton yourself, you feel pretty sure the boat was there?

A. Yes, sir; I think the boat was there. I am satisfied that I asked the agent, I believe, if my boat was there, and I found it on the platform.

Q. Did you go to the hotel?

A. No, sir.

Q. No hotel?

A. No, sir.

Q. You know anybody at Marathon?

A. Yes, sir.

Q. You know Mr. Shepherd, who kept the store there, who owned the plat of the town and keeps the store there?

A. Don't know that I do.

Q. Don't know him?

A. Know a Mr. Heesse, a merchant there.

Q. Now, how did you convey that over to the Boquillas mines—that boat—over to the river, I mean, by the mines?

A. Well, there was some freight wagons going down there with a load of freight to the Boquillas. I hired one man to put this boat on
848 wagon.

Q. How far was that?

A. I don't recollect. I believe they call it something like eighty miles; maybe ninety.

Q. You know what kind of a team he had?

A. Yes, sir; he had a four-horse team.

Q. You know what his name was?

A. Well, I did, but I have forgotten it; that is, I heard it.

Q. How much did he charge for taking it down there?

A. It appears to me that I paid him, I think it was, ten dollars. I won't say that that was exactly the price, but I think that was the price.

Q. Mexican or American money?

A. American money.

Q. Who else was with you?

A. Oh, there was quite a crowd with the teamsters.

Q. Who was with you?

A. W. B. Roundtree.

Q. Where is he?

A. Near Del Rio; he was when I left.

Q. Now, when you got over there to the river, what kind of a condition was the river in, did you say?

A. The river was about two or two and a half feet high they told me. I didn't measure it, and I don't know. It looked to me like two or two and a half—might have been three feet.

Q. And did you stay there before you embarked on your journey?

A. I stayed there four or five days.

Q. Did the river get higher or lower?

A. The river gradually went down, or that is, didn't go down, you might say. I can't tell that there was much decline in it. It didn't either rise or fall, but if any different it went down some.

Q. Now, the river immediately below that is very straight, isn't it?

A. No, sir; it is anything but straight.

Q. You mean to imply by that it is very crooked—long bends?

A. Yes, sir.

849 Q. How long, when you did embark, did you travel on the river?

A. Well, I think I was about seven or eight days before I got down to where I camped there, and I camped in one place seven days.

Q. Well, how long was it before the rain began?

A. It was about seven or eight days—eight days, I think.

Q. You know how fast you went down the river that time?

A. I didn't go fast.

Q. Went slow?

A. Some days I didn't travel fast or very far.

Q. Well, give me an idea of about how many days?

A. I think I travelled at the rate of about fifteen or eighteen miles in a day, on an average.

Q. That by the river?

A. Yes, sir; sometimes I might have travelled twenty-five, and sometimes I didn't travel over ten.

Q. That was up to the time the rainfall occurred?

A. Yes, sir.

Q. Now, do you mean to say that the river was straight or crooked there below that point?

A. Right immediately below Boquillas, it is very crooked for twelve or fifteen miles.

Q. But taking the general course up to the time you quit?

A. Passed through some crooked river, but when you get into the Bullion (?) Cañon, there we have a comparatively straight river for about forty miles.

Q. What proportion of this journey was straight river and what was crooked?

A. Well, I suppose really none of it was perfectly straight.

Q. I don't mean, perhaps, so straight as that.

A. I suppose it was about one-third of this way that the river was very crooked.

Q. How many miles would you on an average be going in order to make a mile in direct distance—going around in order to make a
850 mile in direct distance on the general course of the river?

A. It is hard to tell. I don't suppose it would take two miles to make one. There is a portion of that river there, for nearly forty miles, I travelled over, that it was but very little less than on the river than it would be on the land.

Q. You say that during a portion of that distance you passed through a rock cañon about forty miles?

A. No; I said a rock cañon, about fifteen miles there.

Q. Well, the straight course of the river was forty miles?

A. I said we struck into the Bull's (?) Cañon; what is termed as the Bull's Cañon down in that section of the country; it is a basin or cañon. The mountains don't come directly to the river. In that portion of the river there is nearly forty miles that the river is comparatively straight.

Q. All the way down; what, sandy soil?

A. No, sir.

Q. Much of the way, isn't it sandy soil?

A. Some sandy soil.

Q. What proportion was sandy soil?

A. Very little after you strike the mountains. Below the Boquillas very little sandy soil until you get entirely out of the mountains.

Q. What kind of soil was it?

A. Rock and gravel, and some plains come in.

Q. Now, we will return to the Christmas trip. You started down the river from El Paso on Christmas Day, 1894?

A. Yes, sir.

Q. 1894. I don't want to mislead him. That is what I am anxious to find out.

A. That was six years ago this Christmas time.

Q. That would be Christmas, 1893?

A. Yes, sir.

Q. Did you ship your boat up from Del Rio at that time?

A. No, sir.

Q. You constructed the boat at El Paso?

A. I did.

851 Q. What kind of a boat?

A. A small skiff.

Q. Flat-bottom skiff?

A. No; not flat-bottom; kind of oval in the bottom.

Q. Build it yourself?

A. Built it myself.

Q. Where did you stop there that eight days?

A. I camped inside of the house. This old gentleman—I can't think of his name—he has an old adobe wall to his house, you might call it.

Q. You think of that man's name?

A. No; probably someone of the people here know the gentleman who owns the blacksmith shop.

Q. He was a blacksmith?

A. Yes, sir; runs a shop; right up this side of the old burned hotel that is reconstructed; right adjoining the small lot; the upper end of El Paso street.

Q. Is he living there now?

A. Yes, sir; he was living there the other day. I talked with him.

Q. And you camped in his adobe wall, which wasn't a house?

A. Yes, sir.

Q. Camped there all alone?

A. No, sir; my nephew was with me.

Q. What was his name?

A. McMahan; same name as me.

Q. And you started on Christmas Day?

A. Yes, sir.

Q. Do you remember how far you went—by the way, where did you get the lumber?

A. Bought it in El Paso.

Q. From whom?

A. I don't know the man's name. I went to two different lumber yards there and selected my lumber, and then, when I chose my lumber, I built it.

Q. You brought your tools with you to make the boat?

A. No, sir.

Q. Borrow the tools?

852 A. I got the tools from the old gentleman who runs the shop.

Q. And you can't tell which lumber yard you bought it from?

A. No, sir; don't know.

Q. But you bought it about eight days before Christmas, 1893?

A. I think it was just exactly eight days, if am not mistaken.

Q. Can you tell where the lumber yard was situated?

A. Down south or east from the depot—right down east, probably a block or two.

Q. That is the Southern Pacific depot?

A. Yes, sir.

Q. South and east?

A. South; it was on the right-hand side of the road from here.

Q. Now, the first day, did you say you travelled about twenty miles a day?

A. Yes, sir.

Q. The first day you started, what kind of territory did you pass through?

A. Level country, as far as I could see from the river.

Q. Alluvial soil?

A. Yes, sir.

Q. The next day?

A. The same.

Q. The third day?

A. The same.

Q. The fourth day?

A. Well, there was about the same; looked to me like the same sort of country from what I could see from the river.

Q. The fourth day, that would be eighty miles?

A. Fourth and fifth day, yes.

Q. About the 4th and 5th day?

A. Yes, sir.

Q. That would have brought you about a hundred miles down. What kind of territory did you pass into then?

A. Then I struck the mountains; up a cañon, a place they call a box cañon, where the mountains come right into the river on both sides.

Q. That was the fifth or sixth day now?

A. I don't recollect. I was a day or two, and when I got through, I think we were a day and a half in that kind of country.

853 Q. Then you travelled about thirty miles through this box cañon or rock formation?

A. I call it a cañon; there was mountains come in there.

Q. What was in the bottom of the river?

A. It was more or less gravel and rock. Sometimes you occasionally found sandy banks and a wide channel.

Q. I mean through this thirty miles I am speaking of.

A. That is what I am speaking of. Once in a while in that cañon it was an open valley where the mountains didn't come to the river by two or three or four hundred yards. Probably there you would find a streak of gravel bed to the river and the banks, and the channel was wider. Not altogether exactly the same kind of banks as you found in the main cañon.

Q. Now, thirty miles you went down that way; now, what then did you strike into? That was 130 miles.

A. I suppose it to be something like that. I don't know; I never measured.

Q. That is right, but you are giving only your best recollection and judgment. Now, what did you strike after you got down there?

A. After we went through and out of the mountains, that is, through the cañon, then we struck a more open country. Not an open country, but the mountains was still back further from the river.

Q. What was the character of the river?

A. Well, we struck a valley and a wide channel into the river; that is, long narrow valleys into the river, and the river spread out more or less over the country.

Q. What was the character of the soil?

A. Gravel and sand, and a few rocks occasionally. Occasionally struck a ledge of rocks.

Q. In the bottom of the river?

A. Yes, sir.

Q. Now, when you got beyond the 130 miles—

854 A. Struck another little cañon, or where the mountains came in close to the river.

Q. How far did you traverse that?

A. Well, it appears to me like that was short, not over eight or ten miles.

Q. Well, after you left—say that would take you about 140 miles in that neighborhood—what did you strike into then?

A. We struck into another open country—valleys, more or less.

Q. Narrow valleys or wide?

A. Narrow in places, and sometimes seven or eight miles wide.

Q. How long did you traverse that?

A. I don't recollect now exactly as to every day's travel, as to how long.

Q. Well, about how long was that valley?

A. Probably that valley was forty miles. Might say a continuous valley. It is not a valley, but it is more or less a valley.

Q. What was the nature of that forty miles—the bed of the stream?

A. Well, it was good deal the same as the lower end of this valley below El Paso. Found a wide sandy country there for quite a ways, with cottonwood trees setting on the banks of the river, and you could see out probably in places fifteen miles from the river. The channel of the river was very wide, and the water spread out in lots of places where it had gone crossways on the main channel—between banks, I mean.

Q. No habitation there?

A. No, sir; I didn't see any habitation as I went down the river until we got away down.

Q. No farms neither?

A. No farms.

Q. No indication of civilization?

A. No indication of civilization that I saw.

Q. In this forty-mile valley?

A. Yes, sir; I saw some old ranches there, that appeared to be; didn't see any person.

Q. How did it compare with the valley from El Paso down to Ysleta?

855 A. Well, in close to the river it was nearer the same, but it seems to me the valley was not so wide. The mountains was not set back from the river so far; for instance, half a mile or two miles. It was something like the same, except it looked to me like a white lime soil that wouldn't produce anything, alkali, and one thing and another.

Q. That gets us down about 180 miles. What did you strike into at the bottom of that valley?

A. I struck into another small ledge of mountains.

Q. And what was the formation there?

A. About the same as it was above, in getting through this cañon.

Q. Box cañon?

A. Not a box cañon.

Q. But like it was up in the cañon above?

A. Yes, sir.

Q. That was rock bottom, and all that?

A. Yes; for a short distance there was a rock bottom, and two places there for a hundred yards, or probably a quarter or half a mile, you would find almost solid bottom, or boulders or piles of rocks.

Q. Did you have rapids?

A. Rapids? Plenty of them.

Q. Along there?

A. In there.

Q. In that particular place?

A. Yes, sir.

Q. The water then seemed to jump down, going over the rocks?

A. Yes, sir.

Q. And you had difficulty in getting through?

A. One place we had difficulty in getting through.

Q. How long did that last through that particular range of mountains?

A. I think that particular range of mountains probably wasn't over three or four miles through—think probably five or six. I don't recollect the distance.

Q. That gets us to 185. Now, what did you strike next below that place?

A. We struck out into another valley there that appeared to me—I don't recollect the distance, how long it was, but we travelled probably a day or two in there, in the valley there. That looked like it might have very rich soil in places along the river, and other places very poor, and a good deal of alkali.

Q. A valley country?

A. I didn't mean to say that any of that country is a valley country, more than narrow valleys from the river out.

Q. Mountains by?

A. Mountains set back from the river further in places than in others.

Q. Yes; now about the bed of the stream?

A. That was a flat, sandy, and gravelly soil—banks and the bed all the way down through that valley, and some places very sandy.

Q. You say you travelled about a day and a half through there; I mean you mean by that about thirty miles?

A. I wouldn't pretend to say the distance. I think that valley, to the best of my recollection, was about—I don't know that I recollect the distance.

Q. About a day and a half—thirty miles; that would bring us up to 215 miles, as I figure. What did you strike then at the bottom of that valley?

A. Didn't strike any mountains to amount to anything. Passed around the corners of mountains coming in from different sides of the mountains. And it was continuous valley then until we got down—for several days, until we got down opposite those coal mines down there.

Q. Now, let me understand; from the distance of 215 miles, as I figure it—that is what you have described—from there on, the rest of your journey to the point where you took out your boat, which was—what was it; what was that point?

A. From where I got now is quite a distance—I—if I understand your question—to where I took it out.

Q. That is what I want to find out; what is it?

A. You ask me a question.

857 Q. You have described, now, the character of the territory as you make the journey, estimated in the neighborhood of 215 miles—

A. According to your calculation.

Q. I have kept run of your statements as we have gone along. Now,

the last thing you did was to take a turn around the corners of mountains?

A. Yes, sir.

Q. And then you say you went on; and now I want to find out what the character of the country was from the time you went on until the time you took out the boat. When you stopped you was twenty-one days, don't you know, or two half days you didn't run.

A. Never took the boat out until—until I got—

Q. The time when you got to the end of the twenty-one days itself; that is the period that I want to get at. Now, we have gone over 215 miles, or in that neighborhood, not to be exact; just go on as you have done and let's see what kind of country you passed through.

A. Well, we travelled from the lower end of that point, as I told you—

Q. Around the corner of the mountains.

A. I think we were in the valley for two, probably three days, in the same kind of country.

Q. That would be from forty to sixty miles; that would bring us up—215 and 40 is 255—from 255 to 275 miles?

A. Yes, sir.

Q. Well, then you think you travelled through valleys?

A. Yes, more or less; all through a valley country. Some places the river bank wouldn't be, not above the main bed of the river, two feet or three feet.

Q. How far out from the hillside?

A. Well, whatever distance, from right up to the river, the points of the rise out there, to seven, appeared to me like ten miles, and some places the foot of the mountains.

Q. Some places it was ten miles wide, and sometimes very close?

858 A. A man may be considerably mistaken in looking at a mountain out a distance. I suppose seven or ten miles in places; not any longer.

Q. And the character of the river was the same that you have described in these open valleys?

A. Yes, sir.

Q. Now, when you got below, at the end of that 255 or 275 miles, what did you strike into—you got through those valleys?

A. Got into another cañon, where the hills came up to the river again.

Q. How long did that last?

A. Didn't get more than two hours' travel—two or three hours' travel, until we struck another open place in the valleys. More narrow valleys, perfectly dry up and down on each side of the river, for quite a ways, and there—

Q. Now, you say it was a more narrow valley; what do you mean by that?

A. Narrower—narrower from the banks of the river out to the hills.

Q. Not so broad out to the foothills?

A. Yes, sir.

Q. Now, will you describe how wide that valley was?

A. It appears to me that it varied from one hundred to fourteen hundred yards wide, from the river out to the hills.

Q. And how long was it?

A. Don't recollect exactly—going down the river just one time that way, and being a long time away, but it appears to me like—well, I don't recollect all the distances in every day's travel. I think it would be impossible; I know it would.

Q. About how far did you go through that valley?

A. I don't recollect.

Q. That narrower valley?

A. It wasn't far through.

Q. You had been four hours going through the cañon?

A. Not over four hours, I don't think.

Q. Precisely; and then you came out in this very narrow valley,
859 and how many hours or days was you going down there?

A. I wouldn't undertake to say.

Q. Well, give me a reasonable approximation of it.

A. But according to my recollection, that morning we went out of that cañon through that valley, that we was nearer half a day's travel in that valley.

Q. Then you say four hours, and half a day; that will make, let's say, fifteen or twenty miles more. That brings us from 275 to 290 miles down to the river. Now, what did you strike into then?

A. We struck into another little cañon just above—it appears to me some distance—like, above the San Antonio.

Q. Well, how long did that cañon last you?

A. It was a short cañon, where the river was narrow.

Q. Rock bottom?

A. Rock bottom.

Q. Or sandy bottom?

A. Well, I don't know that I will say that I noticed the bottom particularly; I wasn't sounding the river as I went down, and I noticed the river bed in every particular. I can just give kind of an idea to the best of my recollection.

Q. Now these various cañons; were they of an exceedingly rocky formation or were they not of a rocky formation?

A. Some of them was exceedingly rocky in these cañons.

Q. Apparently solid rock each side of the cañon?

A. Not solid rock.

Q. Not without crevices?

A. The rocks?

Q. Yes, sir. Formation all rocks?

A. Yes, sir.

Q. You would suppose, I suppose, that it was comparatively all rock, from down below?

A. Yes, sir.

Q. And thrown large up to the surface to a considerable height?

A. That is my idea.

860 Q. The water had apparently cut through these rocks in places finding its way down?

A. Appeared to me that it had in time cut through and made its own channel.

Q. In the course of time found its way through. And then you came to San Antonio; that was a landmark?

A. I didn't come to San Antonio. I got there shortly afterwards. I don't recollect whether it was that same day or the next day.

Q. Then about 300 miles below El Paso you reached San Antonio?

A. I don't know. I didn't say it was about 300 miles or any other distance. It was to the best of my belief, that it was the next day after I passed through that cañon. I think the next day I got to San Antonio.

Q. Was there a habitation there?

A. Habitation in the town of San Antonio—a little village.

Q. On the Mexican or American side?

A. Mexican side?

Q. Now, at San Antonio, what is there? What kind of a valley or what kind of hills?

A. You go through a valley there—valley from there, more or less, clean on to Presidio.

Q. You say more or less; does it go through cañons and mountains?

A. Very little, if any. Narrow cañons from there to Presidio.

Q. How far is it from San Antonio to Presidio?

A. I don't know, sir, how far exactly, but it appears to me like to it seventy or eighty miles. I wouldn't say.

Q. Then, as you figure it, it was about 370 or 380 miles from El Paso to Presidio?

A. I haven't made any calculation on it.

Q. You say it seems to me. You mean by the bed of the river, seventy or eighty miles, more or less, or do you mean as the bird flies?

A. I mean by the river.

861 Q. Then it is from 370 to 380 miles, as you have kept the run of these distances down there?

A. I never kept any runs of them. I don't recollect.

Q. Was that when you stopped at the end of the twenty days?

A. At the end of the twenty days that is where I stopped, at Presidio.

Q. And you calculate that you travelled twenty miles a day?

A. Yes, sir.

Q. And you arrived there about the 15th or 16th day of January—left on Christmas Day?

A. I left on Christmas Day.

Q. It would be about the 13th—let's see: December has 31 days, and you left on Christmas; it would be eight days, and you went—it would be about the 12th of January, 1894, that you arrived at Presidio or at San Antonio?

A. Well, I don't recollect anything about the date that I was at San Antonio.

Q. Presidio, that is right. And therefore you would calculate that you went somewheres in the neighborhood of 375 or 400 miles?

A. I estimated that it seemed to be about 200 miles. I think it is just about that, according to my belief.

Q. There you stopped?

A. There I stopped for a period.

Q. How long?

A. I was there 18 days.

Q. What made you stop there?

A. My business so called me there. I was a trapping and hunting there, and found work there.

Q. It wasn't on account of the water running down?

A. No, sir; it wasn't on account of the water running down that I stopped there. I was hunting beavers and found them.

Q. Water did run down?

A. The Rio Grande run down.

Q. Just at Presidio?

862 A. Not on me, because I had left the Rio Grande and was trapping right around the mouth of it and at the Concho.

Q. It was at Presidio that it run down on you?

A. Yes, sir.

Q. That is what I want to get at; where the Concho comes in.

A. The Concho?

Q. Now, you stayed there eighteen days?

A. Yes, sir.

Q. And then you went down?

A. Then I went down the river.

Q. And how far did you go?

A. I went to Del Rio, where I live.

Q. Clear down?

A. And trapped on to Del Rio, where I live.

Q. By boat?

A. Yes, sir.

Q. Took your boat out at home?

A. Yes, sir.

Q. Got it yet?

A. Oh, no.

Q. Didn't keep it?

A. Didn't keep that boat, no. I think I have owned forty or fifty boats since that time; made by myself, most of them.

Judge BURCH. I guess that is all.

Redirect examination, J. H. McMAHAN:

Questioned by Judge FALL. What streams, if any, empty into the Rio Grande River, between the city of El Paso and the mouth of the Concho

A. I don't recollect of any stream whatever emptying into the river between El Paso, except a little stream there not far from San Antonio. A little stream comes in there, when I was passing down the river—a small spring branch. And then above the cañon, above San Antonio, something there, not far from the San Carlos coal mines opposite, there is another creek comes in from the Mexican side, which was, when I was there, furnishing right smart of water; well, no big quantity, but some water; and if there is any other stream that furnished more than

863 a little small spring branches I don't recollect it, except on the

Texas side of the river, at the present time—that is right at San Antonio, or a little above, there is a little spring that comes in from the Texas side. I have forgot the name. They told me when I was there.

Q. No streams of any importance?

A. No streams of any importance.

Q. Three little spring branches?

A. Yes sir; they told me the names of each creek when I was there, but I don't recollect it.

Q. In these different valleys that you have referred to as having passed through on your trip from El Paso to the Concho, how was the channel in this river, wide or narrow?

A. In every respect very wide.

Q. The main channel, that is, from bank to bank?

A. The bed of the river?

Q. That is what I mean; in every respect very wide?

A. Yes, sir.

Q. Now, in these rock places that you passed through in the short cañons, how did the rocks apparently pitch; everything pitch to it?

A. Well, we passed through places that we had to drag or boar over, that would have probably filled in the course of two or three hundred yards, seven or eight feet—kind of a dam.

Q. How was the rock standing there?

A. In different shapes. Hardly ever found these rocks, or reefs, as we call them, but what was filled up with boulders, more or less; and the bed rock, I couldn't tell how that was shaped.

Q. What I mean by the pitch of the rock, would it pitch down?

A. Seemed to be pitched off in some places.

Q. What I mean by the pitch of the rock, which way was the strata lying?

A. In different directions. It showed mostly that we were going up hill against the rock, and there would be found as much fill as the
864 rock apparently had on the banks. Other places it would be right the reverse.

Q. Pitched in every direction?

A. Yes, sir.

Q. You have prospected some?

A. Yes, sir.

Q. What was the character of the rock there?

A. We found that rock down there, generally from here to Presidio, more or less of a soft—might call free stone, or sandy rock.

Judge FALL. That is all.

GEORGE LYNCH, another witness on behalf of the defendants, being duly sworn to testify the truth, the whole truth, etc., on being questioned by Judge A. B. Fall, said on direct examination:

Q. Please state your name, residence, occupation, and age.

A. George Lynch; Hatch, New Mexico; engaged in agriculture; fifty years of age.

Q. Where is Hatch, with reference to Las Cruces, and in what county?

A. It is in Doña Ana County, about forty miles by river; nearly north from here.

Q. How long have you lived in that neighborhood?

A. Since 1876.

Q. What has been your occupation prior to the present time, since you were living at Hatch?

A. Engaged in cattle business and farming.

Q. Where were your cattle ranches, and where did your cattle range?

A. Large part of them ranged on the Rio Grande; some of them about twenty miles from here, near Fort Seldon, and others between Palomas and Colorado.

865 Q. Do you know the country in and around, above and below Las Palomas, on the Rio Grande?

A. I do.

Q. Very well?

A. I am acquainted with it above.

Q. Do you know about the point Elephant Buttes?

A. I do.

Q. Are you familiar with the stream emptying into the Rio Grande at or below Elephant Buttes?

A. I am.

Q. Will you please mention those streams?

A. The Cuchillo, Negro Creek, the Palomas Creek, the Las Animas Creek, Las Perches Creek, the Tierra Blanca Creek, and the Jaralosa.

Q. Which is the last one of those streams on the Rio Grande, that is coming down the Rio Grande?

A. Jaralosa.

Q. How far about does the Jaralosa empty into the Rio Grande below Elephant Butte?

A. About 27 miles; about 32 miles below Elephant Butte.

Q. What is the character of these streams?

A. Except during the rainy season they don't run any water into the river, except in flood.

Q. What has been the character of the streams since you have known them since 1876?

A. The same.

Q. And the last one of these streams you say is 32 miles below Elephant Butte?

A. Yes, sir.

Q. Are you familiar with the Rio Grande from the Jaralosa to El Paso?

A. Tolerably familiar with it.

Q. Do you know of any streams emptying into the Rio Grande from the Jaralosa to El Paso?

A. I do not.

Q. Now, this Jaralosa Creek, Mr. Lynch, about how much water in width and depth would that creek flow in flood time, if you can state approximately?

A. It is very hard to state; it depends upon the rain.

Q. What is the width of the creek, you say?

A. It is an arroyo, you know, and probably about fifty yards wide or so.

866 Q. Where does it head? About how long is it, if you know?

A. It heads up in the Black Range, about thirty or forty miles up in the hills.

Q. Now, the next of these arroyos or streams or creeks going up the river to the Jaralosa?

A. It is the Tierra Blanca.

- Q. About how long is that, if you know?
 A. About the same length.
 Q. What width?
 A. The width about the same.
 Q. Now, the next?
 A. The Trujillo.
 Q. About the length of that?
 A. That is about the same.
 Q. And the width?
 A. It is about the same in width.
 Q. Now, these are all below Elephant Butte?
 A. Yes, sir.
 Q. Now, the next below Elephant Butte and above?
 A. Perches.
 Q. About the width of that?
 A. The Perches is about the same width.
 Q. And the length?
 A. The length might be a little longer.
 Q. And heads in the Black Range?
 A. Yes, sir.
 Q. Has the Perches or any of these streams running water in them?
 A. Up at their heads they have.
 Q. Now, the next below Elephant Butte, if any?
 A. Is the Las Animas.
 Q. What is the character of that?
 A. It has got water in it up above in the cañon, but it don't empty in the Rio Grande.
 Q. Except in—
 A. Except in the flood time.
 Q. And about the length and width of it?
 A. Probably longer than the others—maybe fifty miles.
 Q. Rises in the Black Range?
 A. Yes, sir.
 867 Q. What is the character of the Black Range that you speak of?
 A. It is a range of mountains.
 Q. High or low?
 A. High elevated range of mountains.
 Q. Timber on top—pine timber?
 A. Yes, sir.
 Q. How is the snow in the Black Range with reference to the general character of snow in the mountains in southern New Mexico?
 A. Some there—probably not very long—not more than two weeks.
 Q. Now, is there any other stream in below Elephant Butte?
 A. Palomas.
 Q. And what is the character of that stream?
 A. Same as the others.
 Q. Any other stream in below?
 A. I am not sure whether the Cuchillo Negro enters in above or below Elephant Butte.
 Judge FALL. That is all.

Cross-examination of GEORGE LYNCH:

The COURT. The Cuchillo Negro comes in about seven or eight miles above Palomas?

Judge FALL. The Elephant Butte dam site is right in there some place, and I don't know myself the exact position, and neither does Mr. Lynch, nor whether it empties in just above or just below.

Cross examination by Mr. CHILDERS. You say none of these streams reach the Rio Grande with water except in flood times?

A. That is all.

Q. You know anything about the banks of these streams or arroyos—whether they are high or low?

A. They are big arroyos, but the stream doesn't take up half the arroyo banks—aren't particularly high.

Q. The streams in flood water, in the flood time, doesn't take up the whole?

A. Not every time. It might once in awhile.

868 Does the water occupy the whole channel between the banks in flood time?

A. Do you mean both banks?

Q. Yes; is the channel full?

A. The arroyos are most of them very wide; no, don't fill them all up—the whole.

Q. You are simply giving the width of the channel occupied by the water when you gave it awhile ago?

A. Yes, sir.

Q. That is about fifty yards?

A. Fifty to a hundred yards.

Q. And these banks are rather low, are they not?

A. In places; yes, sir.

Q. You haven't any idea how much water runs down these arroyos; never measured it?

A. No, sir.

Q. How long have you seen them running at a time into the river?

A. I have seen them run for, I think, run sometimes for six hours. I believe I have seen them run as high as two hours and above.

Q. Which one run that long?

A. I think I saw the Perches run for two days.

Q. The Perches has water in it up toward the mountains?

A. Yes, sir.

Q. Hillsborough and Kingston is on the Perches?

A. Yes, sir.

Q. Both of these places—Hillsborough and Kingston?

A. Yes; both on the Perches.

Q. How far below Hillsborough does the water come down?

A. I think it comes down about ten miles below Hillsborough.

Judge FALL. There is another question I should have asked on direct examination. You say you lived in this country for a good many years; since 1876, I believe you said. What was the condition of the Rio Grande in 1879, 1880, or 1881?

A. It went dry in 1879; if I am not mistaken it was in 1879.

869 Q. Where was that?

- A. Up at our place it went dry; I think in July.
 Q. 1879; do you remember any other years its going dry?
 A. No; for a long time it didn't until here of late years.
 Q. How long was it dry at that time, if you remember?
 A. Oh, probably five to six months. I don't believe very much above that.

Cross-examination:

Questioned by Mr. CHILDERS: You say here of late years it has been going dry every year?

A. Yes, sir.

Q. How long has that been the case?

A. Last six years I think.

Q. How far up was it dry in 1879?

A. I don't know how far up it extended.

Q. How far up has it been going dry in the last few years?

A. I can't tell.

Q. You only know of it being dry where you were.

A. Yes, sir.

Further direct-examination:

Questioned by Judge FALL: Mr. Lynch, you are in the cattle business, you say, or you were prior to engaging in your present occupation as a mineral surveyor, etc. Do you know what has been the condition of this section of the country along the Rio Grande River the last, well, say from 1888 to 1895, and during those years, with reference to drought or rainfall?

A. There has been a very extensive drought and little rain.

Q. What was the result of that drought with reference to cattle in this country, and stock?

A. Killed off nearly all of our stock.

Q. How many cattle did you have before this?

870 A. About 12,000 head.

Q. How many did you have after?

A. About 4,000.

Judge FALL. That is all.

Cross-examination:

Questioned by Mr. CHILDERS. When did the cattle commence to die off for want of rainfall?

A. I forgot the exact year.

Q. It wasn't as early as 1888?

A. I believe it was; it began to be dry in 1888.

Q. Commenced to be dryer than it had been before?

A. The cattle began to die in 1888, if I am not mistaken?

Q. But you know there were plenty of cattle in this country up to 1893?

A. There might have been, but there had been a great deal more before 1893.

Q. Wasn't '93 the time when the drought was the severest?

A. No; I don't think so.

Q. Since then or before then?

A. Before then.

Q. Severer before 1893 than it was in 1893?

A. I don't know; as you say, it was severe. It hadn't rained; it was severe all the time.

Q. How much of the country do you include in that statement about the country?

A. I include all this country over which I had a personal knowledge; all from Colorado up to Seldon here.

Q. Las Cruces up to the Black Range?

A. Foot of the Black Range, and out as far as Deming on the west. I include all that country where my cattle used to range.

Q. And how far north?

A. Oh, probably about as far up as my cattle used to run—up around Palomas.

871 Q. Palomas is on the river about how far above Las Cruces?

A. About eighty miles.

Q. How far is it from here to Deming and the foot of the Black Range.

A. It is probably about eighty miles.

Q. And how far to the foot of the Black Range?

A. Foot of the Black Range from here?

Q. Yes, sir.

A. Oh, probably 90 miles—eighty miles in some places; depends upon the way you go.

Q. Depends upon where you strike the Black Range?

A. Yes, sir.

Mr. CHILDERS. That is all.

H. P. BEE.

The deposition of H. P. Bee, a witness on behalf of the defendant, taken before A. W. Winslow, a U. S. commissioner, at Laredo, Webb County, upon a commission issued out of the court on the 4th day of December, 1899; said deposition having been taken on the 9th day of December, 1899, was then read in evidence on behalf of the defendants, as follows:

872 Interrogatory No. 1. Q. What is your name, age, business, and present place of residence, and how long have you resided at your present place of residence?

A. H. P. Bee; aged 38 years. I am custom inspector at Laredo, Texas, and have been for three years resident of Laredo, Texas.

Interrogatory 2. Q. Do you now hold any official position under the United States Government; and if so, what is the same and where are you stationed and how long have you held such official position?

A. I am now and have been since January, 1894, an inspector of U. S. customs, and have been since that time stationed at Carrizo, in Sapata County, and at Laredo, Texas, both of which places are on the Rio Grande.

Interrogatory 3. Q. Do you know the Rio Grande River, and, if you state that you do, state how long you have known the same, how intimately, how closely you have observed the same, over what portion of the same your knowledge extends, and your means of knowledge and opportunities, if any, that you have had of observing the same.

A. I know the Rio Grande River; have known it since 1885. I know it from Fort Shelton, New Mexico, to Rio Grande City, Texas. I have at different times cow hunted on it from Fort Shelton to the mouth of Devil's River. I have lived on the Rio Grande at El Paso, Laredo, and Carrizo; at El Paso for 2 years, at Carrizo for 2 years, and at Laredo for 3 years.

Interrogatory 4. Q. Have you ever resided on the Rio Grande
873 River or near the same, or been on the same; and if you say that you have, name the places on the said river at which you have resided and the places near the same at which you have resided, and the times when you have been on the said river, as near as you can, and in each instance give, as near as you can, the time or times when you so resided at each place, and the length of time you resided at each of such places.

A. This question is answered in my answer to the third interrogatory.

Interrogatory 5. Q. If you have stated that you are acquainted with the Rio Grande River, please state, if you know, whether there has been any changes in the flow of the same since you have known it, and, if you can, in what years or series of years the same occurred, and what such change or changes was or were.

A. My observation has not been sufficiently close to notice any change in the river, if, indeed, there has been any.

Interrogatory 6. Q. State, if you know, what the rainfall is about the place of your present residence, and generally over the watershed of the lower Rio Grande River, as compared to what it was in former years, say five, ten, or fifteen years ago.

A. I do not know.

874 Interrogatory 7. Q. If, in answer to the preceding interrogatory, you say, in substance, that the rainfall there referred to is less than in former years, state, if you know, what, if any, effect such decrease in the rainfall had had on the flow of the Rio Grande, on the stock ranging over such watershed, on the number of the population living thereon, and on the ranges, fields, farms, crops, and grasses thereon.

A. I do not know.

Interrogatory 8. Q. Do you know anything about the present navigation of the Rio Grande River, the number of vessels plying the same, the size thereof, the distance along said river that such navigation extends, the history and importance thereof? And if you say, in substance, that you have knowledge of any such matters, then give in full your knowledge thereon, stating, if you know, the number of vessels plying the said river, their respective draft, tonnage, and names, as near as you can; the number of trips that they make each year, the time it takes to make such trips, the ease or difficulty with which they navigate the stream, the part of such stream so navigated; the value, from a commercial or business standpoint, of such navigation, and any other facts or circumstances within your knowledge bearing upon such navigation.

A. I have no knowledge of any such matters.

875 Interrogatory 9. Q. Please state, if you know, whether the tonnage or volume of the navigation of the Rio Grande, if you have said that the same is navigated, has changed during the last few years, and in what way? And, if you state that it has decreased, state when it so decreased.

A. I have no knowledge of any of these matters.

Interrogatory 10. Q. If you have stated, in substance, that there is navigation on the Rio Grande River, and that the same has decreased in late years, state whether you know the cause or causes of such decrease. And, if you state that you do, what are or is such causes or cause of such decrease?

A. I have no knowledge of these matters.

Interrogatory 11. Q. If you have stated that there is navigation on the Rio Grande River, and that the same has decreased, state generally how the volume and tonnage and value of the same, from a commercial or business standpoint, compares with that of former years.

A. I have no knowledge of these matters.

Interrogatory 12. If you have stated that the Rio Grande River
876 is navigated at present, state, if you know, whether the same at the present time can be navigated successfully from a financial point of view.

A. All that part of the river with which I am acquainted with is not now nor has it ever been navigable.

Interrogatory 13. Q. If you have stated that you know the Rio Grande River, state if, in your opinion, the same is at present a navigable stream; that is, whether it can be navigated successfully from a financial standpoint by private enterprise?

A. No part of the river with which I am acquainted can ever be successfully navigated.

Interrogatory 14. Q. State, if you know, whether the navigation of the Rio Grande was ever in former years maintained at the expense of or assisted financially by either the Government of the United States or by that of Mexico. And, if you say that such has been the case, state, if you know, the period of time when it was so maintained or so assisted, as near as you can. State.

A. I do not know.

Interrogatory 15. Q. If you have stated that the Rio Grande is now or ever has been navigated, what are the facts, if you know, with reference to whether the navigation of the same is now or ever has been a substantial thing or a farce?

A. I do not know.

Interrogatory 16. Q. If you have stated in substance that there
877 is any navigation on the Rio Grande, state what, in your opinion, is the importance of the same as compared to the importance of using the waters of the Rio Grande for irrigation.

A. I do not know.

Interrogatory 17. Q. Do you know where that part of the Rio Grande below Rio Grande City—if you know where the latter place is—gets its principal supply of water from? And if you state that you do, where is it that such principal supply of water comes from?

A. I know nothing further than the geography of the country tells us.

Interrogatory 18. Q. Do you know where the Conchos enters the Rio Grande?

A. Yes, sir.

Interrogatory 19. Q. If you have stated that you know where the Conchos enters the Rio Grande River, please state whether you know

whether the Rio Grande ever goes dry above the place where the Conchos discharges into the same, and, if you say that you do, then state whether the Rio Grande goes dry above the place where the Conchos enters the same, and whether such is a frequent or infrequent occurrence, and give your means of knowledge.

A. The Rio Grande goes dry above the Conchos. I have travelled from 15 to 25 miles in the bed of the Rio Grande for water, finding it standing in holes; whether it is frequent or infrequent I do not know.

878 Interrogatory 20. Q. If you state that you are acquainted with or have observed the Rio Grande River, then state whether, in your opinion, the perennial flow or flood waters of the Rio Grande, which pass El Paso, Texas, would have any appreciable effect on the flow of the Rio Grande River at Laredo?

A. I think not.

Interrogatory 21. Q. If you have stated that you are acquainted with or have observed the Rio Grande River or its flow, can you give an opinion as to how much water would have to pass El Paso, Texas, and for how long a time the flow would have to continue for the same to have any appreciable effect on the flow of the river at Laredo, Texas? And, if you say that you can give such an opinion, please state what your opinion is with reference to such matters.

A. I can not.

Interrogatory 22. Q. If you have said that you have had an acquaintance with the Rio Grande River and its bed or observation of them, state whether, from your experience and knowledge of the said river, the construction of a dam on the same above El Paso, Texas, and the diversion thereby from the river of all its waters would have any influence on the flow of the river at Laredo or would have any influence on the navigability of said river where it is now navigable, and, if any, what that influence would be? And give your reasons.

A. I do not think that any dam across the Rio Grande above El Paso would have any appreciable influence on the volume of water in that river below the mouths of the Conchos, Pecos, Devils River, Las Vacas, and Las Moras.

879 Interrogatory 23. Q. Where was you in the months of May and June, A. D. 1897?

A. I was in Laredo, Texas.

Interrogatory 24. Q. If in answer to interrogatory immediately preceding you state that you were at or near Laredo, Texas, during any part of either of said months, then state whether or not, to your knowledge, any flood waters came down the Rio Grande River and passed Laredo, Texas, during either of such months. And if you say that floods did so come down during either of said months, please state when, as near as you can remember, the length of time that such floods lasted, the height and volume of the same, as near as you can state, at the height of such flood, and also whether or not your attention was particularly called to such river during any part of such months and, if so, what called your attention to the same?

A. I remember the flood, but do not remember how high it was.

Interrogatory 25. If you have stated that any floods came down the Rio Grande River in the months of May or June of A. D. 1897, please

state whether you know of your own knowledge whether all or any portion of such flood waters came from the Upper Rio Grande and whether all or any portion thereof came from any tributaries of the Rio Grande which enter the same above Laredo, Texas? And if you say that you do know, give your reasons for knowing.

A. I know nothing further than newspaper reports at the time.
880 Interrogatory 26. Q. The witness, H. A. McClelland, is asked to state whether or not he ever had any experience in the actual navigation of the Rio Grande River? And if he has, then he is asked to state when he had such experience, at what he was employed when he had the same, and the name of the boat or boats on which he had such experience.

A. I know nothing of this.

Interrogatory 27. Q. If the witness, McClelland, has stated that he has had any experience in navigating the Rio Grande River, then he is asked to state the character, tonnage, size, and draft of the boat or boats navigated, the manner in which such boat or boats navigated the stream, the ease or difficulty with which the same was done, the time it usually took such boat or boats to go from point to point along such river, the daily speed it or they made, how many boats, if he knows, navigated the river at such time, how many yearly trips, if he knows, they made each, whether the same ran on schedule time which was adhered to; and, in this connection, such witness is asked to state, if he remembers, how long it took to make any particular trip up the river and back again, if he remembers the time it took to make any particular trip, when such trip was made, and its termini; and, if there was any difference in the time it took to go up the said river and the time it took to go down the same, the reason for such difference in time, if the witness knows?

A. I know nothing of this matter.

881 Interrogatory 28. Q. Do you know, or can you set forth, any other matter or thing which may be of benefit or advantage to the parties at issue in this cause, or either of them or that may be material to this subject of this your examination, or the matters in question in this cause? If so, set forth the same fully and at large in your answer.

A. My observation of the streams mentioned, is that there has been a decrease in their respective flows for the past 12 years on account of lack of rain upon the watersheds of the same.

(Signed)

HAM P. BEE.

THOMAS R. WORSHAM.

The deposition of Thomas R. Worsham, a witness on behalf of the defendants, taken before A. W. Winslow, a U. S. commissioner, at Laredo, Webb County, Texas, upon a commission issued out of the court on the 4th day of December, 1899; said deposition having been taken on the 9th day of December, 1899, was then read in evidence on behalf of the defendants, as follows:

882 Interrogatory No. 1. Q. What is your name, age, business, and present place of residence, and how long have you resided at your present place of residence?

A. My name is Thomas R. Worsham; I am 57 years of age; I am

inspector of U. S. customs, and reside in Laredo, Texas, where I have resided for the past 9 years.

Interrogatory 2. Q. Do you now hold any official position under the United States Government; and if so, what is the same and where are you stationed, and how long have you held such official position?

A. I am now and have been for the past 9 years inspector of U. S. customs at Laredo, Texas.

Interrogatory 3. Q. Do you know the Rio Grande River? And if you state that you do, state how long you have known the same; how intimately; how closely you have observed the same; over what portion of the same your knowledge extends, and your means of knowledge; and opportunities, if any, that you have had of observing the same.

A. I know the Rio Grande River; have known it since 1867. I am acquainted with the stream from Rio Grande City to Laredo. I have lived on the river and crossed and recrossed it many times during these years.

Interrogatory 4. Q. Have you ever resided on the Rio Grande 883 River or near the same or been on the same? And if you say that you have, name the places on the said river at which you have resided, and the places near the same at which you have resided, and the times when you have been on the said river, as near as you can, and in each instance give, as near as you can, the time or times when you so resided at each place and the length of time you resided at each of such places.

A. I resided from 1868 to 1889 within 36 miles of the river. From 1889 to the present time I have resided in Laredo, Texas.

Interrogatory 5. Q. If you have stated that you are acquainted with the Rio Grande River, please state, if you know, whether there has been any changes in the flow of the same since you have known it; and, if you can, in what years or series of years the same occurred, and what such change or changes was or were.

A. I am of the opinion that in the past 9 or 10 years the volume of water has decreased in the Rio Grande.

Interrogatory 6. Q. State, if you know, what the rainfall is about the place of your present residence, and generally over the watershed of the lower Rio Grande River, as compared to what it was in former years, say five, ten, or fifteen years ago.

A. I was engaged in the ranch business from 1868 to 1889, 36 miles from the Rio Grande, in Zapata County, Texas, and my observation has been that in the past 10 or 15 years there has been a decrease in the rainfall all over that part of the country embraced within the watershed of the Rio Grande.

884 Interrogatory 7. Q. If, in answer to the preceding interrogatory, you say, in substance, that the rainfall there referred to is less than in former years, state, if you know, what, if any, effect such decrease in the rainfall had had on the flow of the Rio Grande, on the stock ranging over such watershed, on the number of the population living thereon, and on the ranges, fields, farms, crops, and grasses thereon.

A. My observation has been that every interest has been affected in consequence of the long droughts that has frequently prevailed along

this border, and it follows that the flow of water in the Rio Grande has decreased.

Interrogatory 8. Do you know anything about the present navigation of the Rio Grande River, the number of vessels plying the same, the size thereof, the distance along said river that such navigation extends, the history and importance thereof? And if you say, in substance, that you have knowledge of any such matters, then give in full your knowledge thereon, stating, if you know, the number of vessels plying the said river; their respective draft, tonnage, and names, as near as you can; the number of trips that they make each year; the time it takes to make such trips; the ease or difficulty with which they navigate the stream; the part of such stream so navigated; the value, from a commercial or business standpoint, of such navigation; and any other facts or circumstances within your knowledge bearing upon such navigation.

A. I can only answer this interrogatory in a general way, viz: In former years, say from 10 to 12 years ago, there was a small, stern-wheel, flat-bottom steamboat that used to make from four to five trips a year between Brownsville and Rio Grande City, carrying freights for the Government and merchants along the river towns, but I am informed that this boat has been discontinued on account of low water.

885 Interrogatory 9. Q. Please state, if you know, whether the tonnage or volume of the navigation of the Rio Grande, if you have said that the same is navigated, has changed during the last few years, and in what way; and, if you state that it has decreased, state when it so decreased.

A. I have answered this question to the best of my knowledge in my answer to the eighth interrogatory.

Interrogatory 10. Q. If you have stated, in substance, that there is navigation on the Rio Grande River and that the same has decreased in late years, state whether you know the cause or causes of such decrease. And, if you state that you do, what are or is such causes or cause of such decrease?

A. I have answered this question to the best of my knowledge in my answer to the 7th and 8th interrogatories.

Interrogatory 11. Q. If you have stated that there is navigation on the Rio Grande River and that the same has decreased, state generally how the volume and tonnage and value of the same, from a commercial or business standpoint, compares with that of former years.

A. The most of this interrogatory I have answered to the best of my knowledge in my answer to the 7th and 8th interrogatories, but from the best of my knowledge of the stream I do not believe the Rio Grande is susceptible of navigation of any practicable purpose.

886 Interrogatory 12. Q. If you have stated that the Rio Grande River is navigated at present, state, if you know, whether the same at the present time can be navigated successfully from a financial point of view.

A. I have answered this interrogatory to the best of my knowledge in my answer to the last preceding interrogatory.

Interrogatory 13. Q. If you have stated that you know the Rio Grande River, state if, in your opinion, the same is at present a navigable stream; that is, whether it can be navigated successfully from a financial standpoint by private enterprise.

A. I do not consider the Rio Grande a navigable stream, and I do not believe that it will ever be such.

Interrogatory 14. State, if you know, whether the navigation of the Rio Grande was ever in former years maintained at the expense of or assisted financially by either the Government of the United States or by that of Mexico; and, if you say that such has been the case, state, if you know, the period of time when it was so maintained or so assisted, as near as you can. State.

A. If the Rio Grande ever received any aid or improvement from either Government, I never heard of it.

Interrogatory 15. Q. If you have stated that the Rio Grande is now or ever has been navigated, what are the facts, if you know, with reference to whether the navigation of the same is now or ever has been a substantial thing or a farce?

A. I have answered this question to the best of my knowledge in my answer to the last preceding interrogatory.

Interrogatory 16. Q. If you have stated in substance that there
887 is any navigation on the Rio Grande, state what, in your opinion, is the importance of the same as compared to the importance of using the waters of the Rio Grande for irrigation.

A. In my opinion the greater number of the population will be decidedly more benefited by irrigation than by navigation.

Interrogatory 17. Q. Do you know where that part of the Rio Grande below Rio Grande City, if you know where the latter place is, gets its principal supply of water from? And if you state that you do, where is it that such principal supply of water comes from?

A. I am not acquainted with the Rio Grande below Rio Grande City.

Interrogatory 18. Q. Do you know where the Conchos enters the Rio Grande?

A. I do not.

Interrogatory 19. Q. If you have stated that you know where the Conchos enters the Rio Grande River, please state whether you know whether the Rio Grande ever goes dry above the place where the Conchos discharges into the same, and, if you say that you do, then state whether the Rio Grande goes dry above the place where the Conchos enters the same and whether such is a frequent or infrequent occurrence, and give your means of knowledge.

A. I know nothing of the Rio Grande above Laredo.

888 Interrogatory 20. Q. If you state that you are acquainted with or have observed the Rio Grande River, then state whether, in your opinion, the perennial flow or flood waters of the Rio Grande which pass El Paso, Texas, would have any appreciable effect on the flow of the Rio Grande River at Laredo.

A. I do not believe that it would have any effect.

Interrogatory 21. Q. If you have stated that you are acquainted with or have observed the Rio Grande River or its flow, can you give an opinion as to how much water would have to pass El Paso, Texas, and for how long a time the flow would have to continue for the same to have any appreciable effect on the flow of the river at Laredo, Texas? And if you say that you can give such an opinion, please state what your opinion is with reference to such matters.

A. I can give no opinion in this matter further than stated in my answer to the last preceding interrogatory.

Interrogatory 22. Q. If you have said that you have had an acquaintance with the Rio Grande River and its bed, or observation of them, state whether from your experience and knowledge of the said river the construction of a dam on the same above El Paso, Texas, and the diversion thereby from the river of all of its waters would have any influence on the flow of the river at Laredo, or would have any influence on the navigability of the said river where it is now navigable, and, if any, what that influence would be, and give your reasons.

A. I am of the opinion that no dam constructed across the Rio Grande above El Paso which diverted all of its waters would have any appreciable effect on the flow of the water at Laredo, for the reason that the Rio Grande receives its flow from streams below El Paso.

889 Interrogatory 23. Q. Where was you in the months of May and June, A. D. 1897?

A. I was in Laredo, Texas.

Interrogatory 24. Q. If, in answer to interrogatory immediately preceding, you state that you were at or near Laredo, Texas, during any part of either of said months, then state whether or not, to your knowledge, any flood waters came down the Rio Grande River and passed Laredo, Texas, during either of such months. And if you say that floods did so come down during either of said months, please state when, as near as you can remember, the length of time that such floods lasted, the height and volume of the same, as near as you can state, at the height of such flood, and also whether or not your attention was particularly called to such river during any part of such months, and, if so, what called your attention to the same.

A. I do not remember.

Interrogatory 25. Q. If you have stated that any floods came down the Rio Grande River in the months of May or June of A. D. 1897, please state whether you know of your own knowledge whether all or any portion of such flood waters came from the Upper Rio Grande and whether all or any portion thereof came from any tributaries of the Rio Grande which enter the same above Laredo, Texas. And if you say that you do know, give your reasons for knowing.

A. I do not remember.

890 Interrogatory 26. Q. The witness, H. A. McClelland, is asked to state whether or not he ever had any experience in the actual navigation of the Rio Grande River; and if he has, then he is asked to state when he had such experience, at what he was employed when he had the same, and the name of the boat or boats on which he had such experience.

Interrogatory 27. Q. If the witness, McClelland, has stated that he has had any experience in navigating the Rio Grande River, then he is asked to state the character, tonnage, size, and draft of the boat or boats navigated; the manner in which such boat or boats navigated the stream; the ease or difficulty with which the same was done; the time it usually took such boat or boats to go from point to point along such river; the daily speed it or they made; how many boats, if he knows, navigated the river at such time; how many yearly trips, if he knows, they made

each; whether the same ran on schedule time, which was adhered to; and in this connection such witness is asked to state, if he remembers, how long it took to make any particular trip up the river and back again; if he remembers the time it took to make any particular trip, when such trip was made, and its termini, and, if there was any difference in the time it took to go up the said river and the time it took to go down the same, the reason for such difference in time, if the witness knows.

(Interrogatories 26 and 27 being directed to the witness, H. A. McClelland, this witness answers that he does not know anything of any of the matters inquired in said interrogatories.)

891 Interrogatory 28. Q. Do you know, or can you set forth, any other matter or thing which may be of benefit or advantage to the parties at issue in this cause, or either of them, or that may be material to the subject of this your examination or the matters in question in this cause? If so, set forth the same fully and at large in your answer.

A. I know nothing of any of these matters.

No cross-interrogatories.

(Signed)

THOS. R. WORSHAM.

H. A. McCLELLAND.

The deposition of H. A. McClelland, a witness on behalf of the defendants, taken before A. W. Winslow, a U. S. commissioner, at Laredo, Webb County, Texas, upon a commission issued out of the court on the 4th day of December, 1899; said deposition having been taken on the 0th day of December, 1899, was then read in evidence on behalf of the defendants, as follows:

892 Interrogatory No. 1. Q. What is your name, age, business, and present place of residence, and how long have you resided at your present place of residence?

A. My name is H. A. McClelland; am 54 years of age; by occupation a clerk, and I reside in Laredo, and have resided here for the past 18 years.

Interrogatory 2. Q. Do you now hold any official position under the United States Government; and if so, what is the same, and where are you stationed, and how long have you held such official position?

A. I do not.

Interrogatory 3. Q. Do you know the Rio Grande River? And if you state that you do, state how long you have known the same, how intimately, how closely you have observed the same, over what portion of the same your knowledge extends, and your means of knowledge and opportunities, if any, that you have had of observing the same.

A. I know the Rio Grande; have known it for about 20 years; I knew said river from 45 miles above Laredo to the mouth thereof; have lived and scouted on the river, and steamboated on it from Camargo, Mexico, to its mouth.

Interrogatory 4. Q. Have you ever resided on the Rio Grande
893 River, or near the same, or been on the same? And if you say that you have, name the places on the said river at which you have resided, and the places near the same at which you have resided, and the times when you have been on the said river, as near as you can, and in

each instance give, as near as you can, the time or times when you so resided at each place, and the length of time you resided at each of such places.

A. That question is answered in my answer to the third interrogatory; however, I will state in this connection that I resided in Brownsville, Texas, and Laredo, Texas; I resided in Brownsville from March 14th, 1872, to June, 1873; I resided at Carrizo, Texas, from March, 1874, to December, 1878, and at San Bartolo as deputy collector of U. S. customs, and again resided at Carrizo and San Bartolo from April, 1879, to 1880 or 1881. I served as clerk of the district and county court of Zapata County, and also taught school in that county.

Interrogatory 5. Q. If you have stated that you are acquainted with the Rio Grande River, please state, if you know, whether there has been any changes in the flow of the same since you have known it; and, if you can, in what years or series of years the same occurred, and what such change or changes was or were.

A. In the past 10 years I have noticed a diminution in the flow of the Rio Grande.

Interrogatory 6. Q. State, if you know, what the rainfall is about the place of your present residence and generally over the watershed of the lower Rio Grande River, as compared to what it was in former years, say five, ten, or fifteen years ago.

A. My observation is that within the past 10 years the rainfall upon the watersheds of the Rio Grande has not at all compared with former years.

894 Interrogatory 7. Q. If, in answer to the preceding interrogatory, you say, in substance, that the rainfall there referred to is less than in former years, state, if you know, what, if any, effect such decrease in the rainfall had had on the flow of the Rio Grande, on the stock ranging over such watershed, on the number of the population living thereon, and on the ranges, fields, farms, crops, and grasses thereon.

A. On account of the extended droughts that has prevailed in this western country within the past 10 years, every interest has suffered.

Interrogatory 8. Do you know anything about the present navigation of the Rio Grande River, the number of vessels plying the same, the size thereof, the distance along said river that such navigation extends, the history and importance thereof? And if you say, in substance, that you have knowledge of any such matters, then give in full your knowledge thereon, stating, if you know, the number of vessels plying the said river, their respective draft, tonnage, and names, as near as you can, the number of trips they make each year, the time it takes to make such trips, the ease or difficulty with which they navigate the stream, the part of such stream so navigated; the value, from a commercial or business standpoint, of such navigation, and any other facts or circumstances within your knowledge bearing upon such navigation.

A. Navigation on the Rio Grande is confined to that part of the river lying between Rio Grande City and the mouth of the river. It is not susceptible of practicable navigation between Rio Grande City and Brownsville, and such navigation between the points last mentioned is a mere farce. I was once 42 days in making a trip from Brownsville to Rio Grande City and return on the steamboat "San Roman." I was

engaged in steamboating on this river from December, 1872, to June, 1873, and the conditions, if possible, are more unfavorable now than then.

895 Interrogatory 9. Q. Please state, if you know, whether the tonnage or volume of the navigation of the Rio Grande, if you have said that the same is navigated, has changed during the last few years, and in what way. And, if you state that it has decreased, state when it so decreased.

A. I have answered this question to the best of my knowledge in my answer to the 8th interrogatory.

Interrogatory 10. Q. If you have stated, in substance, that there is navigation on the Rio Grande River, and that the same has decreased in late years, state whether you know the cause or causes of such decrease. And, if you state that you do, what are or is such causes or cause of such decrease?

A. The Rio Grande has never been considered a navigable stream by those that have any knowledge of navigation. The decrease in the navigation of this river, if any, is, as a matter of course, attributed to a want of a sufficient volume of water, which in turn is attributed to a want of sufficient rainfall on the watersheds of the Rio Grande.

Interrogatory 11. Q. If you have stated that there is navigation on the Rio Grande River, and that the same has decreased, state generally how the volume and tonnage and value of the same, from a commercial or business standpoint, compares with that of former years.

A. I have answered this interrogatory, to the best of my knowledge, in my answer to the 10th interrogatory.

Interrogatory 12. Q. If you have stated that the Rio Grande
896 River is navigated at present, state, if you know, whether the same at the present time can be navigated successfully, from a financial point of view.

A. No; it can not.

Interrogatory 13. Q. If you have stated that you know the Rio Grande River, state if, in your opinion, the same is at present a navigable stream; that is, whether it can be navigated successfully, from a financial standpoint, by private enterprise.

A. It can not.

Interrogatory 14. State, if you know, whether the navigation of the Rio Grande was ever in former years maintained at the expense of or assisted financially by either the Government of the United States or by that of Mexico; and if you say that such has been the case, state, if you know, the period of time when it was so maintained or so assisted, as near as you can state.

A. I am satisfied that the Rio Grande has never received any assistance from either Government.

Interrogatory 15. Q. If you have stated that the Rio Grande is now or ever has been navigated, what are the facts, if you know, with reference to whether the navigation of the same is now or ever has been a substantial thing or a farce?

A. Most decidedly a farce from Brownsville up.

Interrogatory 16. Q. If you have stated, in substance, that there
897 is any navigation on the Rio Grande, state what, in your opinion,

is the importance of the same as compared to the importance of using the waters of the Rio Grande for irrigation.

A. One year's diversion of the waters of the Rio Grande for the purpose of irrigation would, in my opinion, be of more practicable use and benefit to the people of the country than five hundred years of navigation on that stream.

Interrogatory 17. Q. Do you know where that part of the Rio Grande, below Rio Grande City—if you know where the latter place is—gets its principal supply of water from? And if you state that you do, where is it that such principal supply of water comes from?

A. There is no streams of any size that empty into the Rio Grande below Rio Grande City.

Interrogatory 18. Q. Do you know where the Conchos enters the Rio Grande?

A. I do not.

Interrogatory 19. Q. If you have stated that you know where the Conchos enters the Rio Grande River, please state whether you know whether the Rio Grande ever goes dry above the place where the Conchos discharges into the same; and, if you say that you do, then state whether the Rio Grande goes dry above the place where the Conchos enters the same, and whether such is a frequent or infrequent occurrence, and give your means of knowledge.

A. I do not know.

898 Interrogatory 20. Q. If you state that you are acquainted with or have observed the Rio Grande River, then state whether, in your opinion, the perennial flow or flood waters of the Rio Grande which pass El Paso, Texas, would have any appreciable effect on the flow of the Rio Grande River at Laredo.

A. In my opinion it would have little or no effect.

Interrogatory 21. Q. If you have stated that you are acquainted with or have observed the Rio Grande River or its flow, can you give an opinion as to how much water would have to pass El Paso, Texas, and for how long a time the flow would have to continue, for the same to have any appreciable effect on the flow of the river at Laredo, Texas? And if you say that you can give such an opinion, please state what your opinion is with reference to such matters.

A. I can give no opinion.

Interrogatory 22. Q. If you have said that you have had an acquaintance with the Rio Grande River and its bed or observation of them, state whether, from your experience and knowledge of the said river, the construction of a dam on the same above El Paso, Texas, and the diversion thereby from the river of all of its waters, would have any influence on the flow of the river at Laredo, or would have any influence on the navigability of the said river where it is now navigable, and, if any, what that influence would be; and give your reasons.

A. I do not think the construction of a dam across the Rio Grande anywhere above El Paso and the conversion of the waters thereof would have any noticeable effect on said river at Laredo.

899 Interrogatory 23. Q. Where was you in the months of May and June, A. D. 1897?

A. I was in Laredo.

Interrogatory 24. Q. If in answer to interrogatory immediately preceding you state that you were at or near Laredo, Texas, during any part of either of said months, then state whether or not, to your knowledge, any flood waters came down the Rio Grande River and passed Laredo, Texas, during either of such months. And if you say that floods did so come down during either of said months, please state when, as near as you can remember, the length of time that such floods lasted, the height and volume of the same, as near as you can state, at the height of such flood, and also whether or not your attention was particularly called to such river during any part of such months, and, if so, what called your attention to the same.

A. I do not remember the extent of the rise in the river, if there was any.

Interrogatory 25. If you have stated that any floods came down the Rio Grande River in the months of May or June of A. D. 1897, please state whether you know of your own knowledge whether all or any portion of such flood waters came from the Upper Rio Grande, and whether all or any portion thereof came from any tributaries of the Rio Grande which enter the same above Laredo, Texas; and if you say that you do know, give your reasons for knowing.

A. I have no recollection of the matter.

900 Interrogatory 26. Q. The witness, H. A. McClelland, is asked to state whether or not he ever had any experience in the actual navigation of the Rio Grande River. And if he has, then he is asked to state when he had such experience, at what he was employed when he had the same, and the name of the boat or boats on which he had such experience.

A. From December, 1872, to June, 1873, I was watchman on the side-wheel steamer "San Roman," then running between Brownsville and Rio Grande City.

Interrogatory 27. Q. If the witness, McClelland, has stated that he has had any experience in navigating the Rio Grande River, then he is asked to state the character, tonnage, size, and draft of the boat or boats navigated; the manner in which such boat or boats navigated the stream; the ease or difficulty with which the same was done; the time it usually took such boat or boats to go from point to point along such river; the daily speed it or they made; how many boats, if he knows, navigated the river at such time; how many yearly trips, if he knows, they made each; whether the same ran on schedule time which was adhered to, and in this connection such witness is asked to state, if he remembers, how long it took to make any particular trip up the river and back again, if he remembers the time it took to make any particular trip, when such trip was made, and its termini, and if there was any difference in the time it took to go up the said river and the time it took to go down the same; the reason for such difference in time, if the witness knows.

A. The boat was a light-draft steamboat; do not remember tonnage, but do remember that the navigation of the river was attended with great difficulty on account of the sand bars and the shallowness of the water. The most of the time was taken up in zigzag'ing the stream in search of dead water. The time in traveling from point to point was indefinite; the daily speed was also indefinite. It was impossible to run on any

schedule time. We usually went down the river in from 3 to five days, but as a rule we were light.

901 Interrogatory 28. Q. Do you know, or can you set forth, any other matter or thing which may be of benefit or advantage to the parties at issue in this cause, or either of them, or that may be material to the subject of this, your examination, or the matters in question in this cause? If so, set forth the same fully and at large in your answer.

A. I have stated about all I know in regard to these matters.

No cross-interrogatories.

(Signed)

H. A. McCLELLAND.

F. H. EARNEST.

The deposition of F. H. Earnest, a witness on behalf of the defendants, taken before A. W. Winslow, a U. S. commissioner, at Laredo, Webb County, Texas, upon a commission issued out of the court on the 4th day of December, 1899 (said deposition having been taken on the 9th day of December, 1899), was then read in evidence on behalf of the defendants, as follows:

902 Interrogatory No. 1. Q. What is your name, age, business, and present place of residence, and how long have you resided at your present place of residence?

A. My name is F. H. Earnest; age, 43 years; I am now, and have been for six years, inspector of U. S. customs. I live in Laredo, Texas, and have lived here for the past six years.

Interrogatory 2. Q. Do you now hold any official position under the United States Government, and if so, what is the same and where are you stationed, and how long have you held such official position?

A. I am now, and have been for the past 6 years, inspector of U. S. customs, and am stationed at Laredo, Texas, and for 4 years was stationed on the bridge across the Rio Grande at this point.

Interrogatory 3. Q. Do you know the Rio Grande River, and, if you state that you do, state how long you have known the same, how intimately, how closely you have observed the same, over what portion of the same your knowledge extends and your means of knowledge and opportunities, if any, that you have had of observing the same.

A. I am acquainted with the Rio Grande, and have known it since 1882; since January, 1894, I have lived on the bank of the Rio Grande in Laredo, Texas. From January, 1894, to May 1st, 1898, I was stationed on the bridge across the river at this point.

903 Interrogatory 4. Q. Have you ever resided on the Rio Grande River, or near the same, or been on the same? And if you say that you have, name the places on the said river at which you have resided, and the places near the same at which you have resided, and the times when you have been on the said river, as near as you can, and in each instance give, as near as you can, the time or times when you so resided at each place and the length of time you resided at each of such places.

A. This question is answered in my answer to the 3rd interrogatory, except that I also resided at Carrizo, in Zapata County, one year, which was in the year of 1884.

Interrogatory 5. Q. If you have stated that you are acquainted with

the Rio Grande River, please state, if you know, whether there has been any changes in the flow of the same since you have known it, and, if you can, in what years, or series of years, the same occurred, and what such change or changes was or were.

A. I have not observed any general change in the flow of the Rio Grande, except such as were produced by droughts.

Interrogatory 6. Q. State, if you know, what the rainfall is about the place of your present residence and generally over the watershed of the Lower Rio Grande River, as compared to what it was in former years, say five, ten, or fifteen years ago.

A. I know that this section of the country has been visited with a number of droughts of long duration within the past 9 years.

904 Interrogatory 7. Q. If in answer to the preceding interrogatory you say, in substance, that the rainfall there referred to is less than in former years, state, if you know, what, if any, effect such decrease in the rainfall had had on the flow of the Rio Grande, on the stock ranging over such watershed, on the number of the population living thereon, and on the ranges, fields, farms, crops, and grasses thereon.

A. The rainfall was greater and more generally distributed from 1882 to 1890 than from 1890 to the present time on the watersheds of the Rio Grande. As to the flow on the Rio Grande I can not state, but as to the stock interest it has suffered heavily in the past 9 years and all interests have suffered in the same proportion.

Interrogatory 8. Do you know anything about the present navigation of the Rio Grande River, the number of vessels plying the same, the size thereof, the distance along said river that such navigation extends, the history and importance thereof? And if you say, in substance, that you have knowledge of any such matters, then give in full your knowledge thereon, stating, if you know, the number of vessels plying the said river, their respective draft, tonnage, and names, as near as you can, the number of trips that they make each year, the time it takes to make such trips, the ease or difficulty with which they navigate the stream, the part of such stream so navigated, the value from a commercial or business standpoint of such navigation, and any other facts or circumstances within your knowledge bearing upon such navigation.

A. I know little or nothing of the navigability of the Rio Grande, further than I know that there is now or was a small steamboat running between Brownsville and Rio Grande City.

905 Interrogatory 9. Q. Please state, if you know, whether the tonnage or volume of the navigation of the Rio Grande, if you have said that the same is navigated, has changed during the last few years, and in what way. And, if you state that it has decreased, state when it so decreased.

A. My answer to this interrogatory has been answered in my answer to the last preceding interrogatory.

Interrogatory 10. Q. If you have stated, in substance, that there is navigation on the Rio Grande River and that the same has decreased in late years, state whether you know the cause or causes of such decrease. And, if you state that you do, what are or is such causes or cause of such decrease?

A. I have answered this interrogatory in my answer to the 8th interrogatory, to the best of my knowledge.

Interrogatory 11. Q. If you have stated that there is navigation on the Rio Grande River and that the same has decreased, state, generally, how the volume and tonnage and value of the same from a commercial or business standpoint compares with that of former years.

A. I have answered this interrogatory in my answer to the 8th interrogatory, to the best of my knowledge.

Interrogatory 12. Q. If you have stated that the Rio Grande River is navigated at present, state, if you know, whether the same at the present time can be navigated successfully from a financial point of view.

A. I have answered this interrogatory in my answer to the 8th interrogatory, to the best of my knowledge.

Interrogatory 13. Q. If you have stated that you know the Rio Grande River, state if, in your opinion, the same is at present a navigable stream; that is, whether it can be navigated successfully from a financial standpoint by private enterprise.

A. It can not be navigated above Rio Grande City.

Interrogatory 14. State, if you know, whether the navigation of the Rio Grande was ever in former years maintained at the expense of or assisted financially by either the Government of the United States or by that of Mexico. And, if you say that such has been the case, state, if you know, the period of time when it was so maintained or so assisted, as near as you can. State.

A. I do not know.

Interrogatory 15. Q. If you have stated that the Rio Grande is now or ever has been navigated, what are the facts, if you know, with reference to whether the navigation of the same is now or ever has been a substantial thing or a farce?

A. I know nothing about it.

Interrogatory 16. Q. If you have stated in substance that there is any navigation on the Rio Grande, state what, in your opinion, is the importance of the same as compared to the importance of using the waters of the Rio Grande for irrigation.

A. I think that the waters of the Rio Grande can be more profitably employed for the purpose of irrigation than for navigation.

Interrogatory 17. Q. Do you know where that part of the Rio Grande below Rio Grande City, if you know where the latter place is, gets its principal supply of water from? And if you state that you do, where is it that such principal supply of water comes from?

A. I know of no river or stream that flows into the said river below the mouth of the San Juan River.

Interrogatory 18. Q. Do you know where the Conchos enters the Rio Grande?

A. I do not.

Interrogatory 19. Q. If you have stated that you know where the Conchos enters the Rio Grande River, please state whether you know whether the Rio Grande ever goes dry above the place where the Conchos discharges into the same, and, if you say that you do, then state whether the Rio Grande goes dry above the place where the Conchos enters the same and whether such is a frequent or infrequent occurrence, and give your means of knowledge.

A. I do not know, as I am not acquainted with that part of the river.

908 Interrogatory 20. Q. If you state that you are acquainted with or have observed the Rio Grande River, then state whether, in your opinion, the perennial flow or flood waters of the Rio Grande which pass El Paso, Texas, would have any appreciable effect on the flow of the Rio Grande River at Laredo.

A. The perennial flow would not; flood waters slight.

Interrogatory 21. Q. If you have stated that you are acquainted with or have observed the Rio Grande River or its flow, can you give an opinion as to how much water would have to pass El Paso, Texas, and for how long a time the flow would have to continue for the same to have any appreciable effect on the flow of the river at Laredo, Texas? And, if you say that you can give such an opinion, please state what your opinion is with reference to such matters.

A. I do not feel competent to give an opinion upon such a complex question.

Interrogatory 22. Q. If you have said that you have had an acquaintance with the Rio Grande River and its bed, or observation of them, state whether, from your experience and knowledge of the said river, the construction of a dam on the same above El Paso, Texas, and the diversion thereby from the river of all of its waters, would have any influence on the flow of the river at Laredo, or would have any influence on the navigability of the said river where it is now navigable; and, if any, what that influence would be, and give your reasons.

A. I do not believe that the construction of a dam across the Rio Grande above El Paso and a diversion of all the waters therein would affect the flow of the river at Laredo, Texas, to any appreciable extent.

909 Interrogatory 23. Q. Where was you in the months of May and June, A. D. 1897?

A. From about the first day of May to the 20th of May, 1897, I was in San Antonio, attending to Federal court, and from the 20th on I was in Laredo, Texas.

Interrogatory 24. Q. If, in answer to interrogatory immediately preceding, you state that you were at or near Laredo, Texas, during any part of either of said months, then state whether or not, to your knowledge, any flood waters came down the Rio Grande River and passed Laredo, Texas, during either of such months; and, if you say that floods did so come down during either of said months, please state when, as near as you can remember, the length of time that such floods lasted, the height and volume of the same, as near as you can state, at the height of such flood, and also whether or not your attention was particularly called to such river during any part of such months, and, if so, what called your attention to the same.

A. During the time mentioned in preceding interrogatory I noticed in the columns of the daily papers that there was a great flood raging in the Rio Grande at El Paso, doing a large amount of damage to that city, and, as a matter of course, I was looking for the river to rise high at this point, but to the best of my recollection the river did not rise over six feet at Laredo.

Interrogatory 25. Q. If you have stated that any floods came down the Rio Grande River in the months of May or June of A. D. 1897, please state whether you know, of your own knowledge, whether all or any portion of such flood waters came from the upper Rio Grande, and whether all or any portion thereof came from any tributaries of the Rio Grande which enter the same above Laredo, Texas; and if you say that you do know, give your reasons for knowing.

A. I remember of no flood waters entering the Rio Grande at the time mentioned below El Paso.

910 Interrogatory 26. Q. The witness, H. A. McClelland, is asked to state whether or not he ever had any experience in the actual navigation of the Rio Grande River. And if he has, then he is asked to state when he had such experience, at what he was employed when he had the same, and the name of the boat or boats on which he had such experience.

Interrogatory 27. Q. If the witness, McClelland, has stated that he has had any experience in navigating the Rio Grande River, then he is asked to state the character, tonnage, size, and draft of the boat or boats navigated; the manner in which such boat or boats navigated the stream; the ease or difficulty with which the same was done; the time it usually took such boat or boats to go from point to point along such river; the daily speed it or they made; how many boats, if he knows, navigated the river at such time; how many yearly trips, if he knows, they made each; whether the same ran on schedule time which was adhered to, and in this connection such witness is asked to state, if he remembers, how long it took to make any particular trip up the river and back again, if he remembers the time it took to make any particular trip, when such trip was made, and its termini, and if there was any difference in the time it took to go up the said river and the time it took to go down the same; the reason for such difference in time, if the witness knows.

(Interrogatories 26 and 27 directed to witness, H. A. McClelland, to which this witness states he knows nothing.)

911 Interrogatory 28. Q. Do you know, or can you set forth, any other matter or thing which may be of benefit or advantage to the parties at issue in this cause, or either of them, or that may be material to the subject of this, your examination, or the matters in question in this cause? If so, set forth the same fully and at large in your answer.

A. I know nothing; neither do I know of anything else that would be beneficial to either of the parties to this suit.

No cross-interrogatories.

(Signed)

F. H. EARNEST.

P. F. GARRETT, another witness on behalf of the defendants, being called and sworn to testify the truth, the whole truth, and nothing but the truth, etc., on being questioned by Mr. Hawking, said on direct examination:

Q. Are you acquainted with any portion of the State of Texas which is in the neighborhood of that section which is traversed by the Rio Grande River; if so, what portions of the State are you acquainted with?

A. Yes, sir; I am acquainted with portions of the State; that is, east

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912 of the Rio Grande. I have been over several of the counties—
Bee County, Live Oak County, Patasco County, Bexar Uvalde,
and a number of places.

Q. When did you first become acquainted with that section of the country?

A. I first went into that country in 1873.

Mr. CHILDERS. I would like to ask you if these counties are 'long the river that you mention.

Judge FALL. He said they were east of the river.

A. Maverie County is on the river; that I know something about.

Q. You say you first got acquainted with it in 1883?

A. In 1873 I first went to southern Texas.

Q. Do you know whether or not there has been any change in the climate of that country as far as rainfall or drought is concerned since you first became acquainted with it?

A. My opinion is there has been a change there.

Q. When were you last down in that section or any part of the same?

A. I left that country in 1896 and have been back there since. I was there in 1897.

Q. Where did you reside when you left there in 1896?

A. At Uvalde, Texas.

Q. How far east of the Rio Grande is that?

A. The nearest point is something like fifty or sixty-five miles.

Q. What was the condition of that country when you left there as to climate?

A. It was very dry.

Q. How long had it been dry?

A. I moved from New Mexico down there in 1891. It was dry then and continued to get dryer up to the time I left.

Q. Had there been any effect at the time you moved there, in 1893, of the climate upon the vegetation or stock interest?

A. Yes, sir; the stock interest was greatly damaged by the
913 drought. Of course it varied. It would be times that we would have no rains and the grass burned up, but in a general way it continued to get worse.

Q. Has there been any stream flowing near Uvalde which in former years was a flowing stream, but which is now dry, or practically so?

A. The Leona. Uvalde is located on the Leona—west side of the Leona.

Q. When did you first know the Leona?

A. Never knew it until I went there. My first visit was in 1890.

Q. Was it dry in 1890, at that time?

A. No, sir.

Q. When did it become dry?

A. My impression is, the best I remember, in 1893. It might have been 1892 that the main spring right close to the town went entirely dry.

Q. What caused that?

A. It was attributed to the lack of rainfall by the people there.

Q. Do you know any other streams which are dry, or which have decreased in their rainfall, in the general section of the country traversed by the Rio Grande, other than this stream you have just mentioned?

A. My personal observation was the most of the Leona, but in a general way I know that the Fria or the Nueces, which is west of the Leona something like eight to twelve miles—I don't know the exact distance—the water in it has grown less gradually, and there are others also. The Fria is next east to the Leona. The Sabinas and the Medina were spoken of in a general way by the people there that all these streams were gradually running less water.

Q. Were you the owner while at Uvalde of any stock or cattle?

A. Yes, sir; a few horses and cattle.

Q. Did you suffer any loss from such drought with reference to such interests?

A. Yes, sir.

Q. To what extent?

A. Why, I lost a good many horses from drought, short pasture, 914 age, and was compelled to move my horses—I think it was in 1894—and seek a range in different places.

Q. Do you know, in a general way, how extensive the drought-stricken section of the country was?

A. I don't know that I can say exactly about that. There was a large area of country that was considerably covered with the drought—the country east and north of that.

Mr. HAWKINS. That is all.

Cross-examination:

Questioned by Judge BURCH. The Leona didn't run into the Rio Grande?

A. No, sir.

Q. Goes across southeast and goes into Corpus Christi Bay?

A. Empties into the Nueces, and the Nueces empties in the bay.

Q. Then it is not a tributary at all of the Rio Grande?

A. No, sir.

Q. Have you ever seen this part of the country, in this part of the country, since you came into, that the river didn't run dry some part of the year?

A. Yes, sir.

Q. Which one?

A. Oh, I know a number of streams; the Ruidoso, and Rio Bonito, and South Spring River, and North Spring River. In this country, you mean?

Q. No; I mean in the country that counsel referred to.

A. You said in this country.

Q. I meant to imply my question to the territory which you have been testifying about.

A. Why, most all of the streams in this section that I have been testifying about sink in this dry time; however, they seemed to have been getting further up; the water don't extend as far as it did.

Q. In other words, they dry up further from the mouth?

915 A. They have been doing that since 1891, the time when I went there.

Q. Didn't they ever do it before?

A. I don't think so. The stream when I was there—the Nueces—run

a great deal of water. When I went down in that country in 1873 seemed to be a great deal more water than there was later.

Q. How many years did you stay back there this last time?

A. Went in 1891 and left in 1896.

Q. Five years?

A. Something like that.

Q. You wouldn't have any definite way of ascertaining whether they average up one in ten years, would you?

A. Well, I don't say that I would.

Q. And, moreover, isn't it the tendency of almost all of that arid belt down there for the vegetation—the pasturage—to get poorer? In other words, isn't it constantly caused by keeping the herds more together?

A. I think the cause of the pasturage being so much worse the last ten or twelve years has been the drought.

Q. And wholly that?

A. Of course, if you overstock a country it makes no difference how much land you have. If you have too much stock you tramp the pasturage out. The trouble in that country has been the drought.

Q. Did they feed any sheep down in that country?

A. Not that I know of.

Q. You don't know of their having any sheep there?

A. No, sir.

Q. Now, I will ask you this question: Isn't it a matter of common knowledge that in all parts of the West—I speak now of the arid portion of the West—that this pasturage—that the vegetation has grown scarcer and scarcer with the stock put on the country—not as good as it used to be years ago?

A. The drought has caused the most of it; perhaps some overstocking of it, too.

Q. You can't say, then, whether once in ten years or such a thing as that, the mean annual average rainfall or the rainfall has averaged up with the ten years previous?

916 A. My observation is that since I went there in 1891 that it has been getting dryer up to since I left. I don't know that it

Q. Didn't you have any rainfall at all?

A. Oh, yes; we did. We have had some showers and rains—what you would call pretty good rains.

Q. How long would they last?

A. Oh, I can't say about that.

Q. How long is the longest one you ever saw?

A. Oh, I don't remember; I wouldn't undertake to say—don't remember.

Q. Twenty-four hours.

A. I don't think I ever heard of a hard rain there lasting twenty-four hours. It might rain for three or four hours, and then drizzle and rain light for a few hours.

Q. Not in all this country, do you think?

A. I don't remember any such rain.

Judge BURCH. That is all.

Redirect examination:

Judge FALL. One more question. Was there as much stock when you left Uvalde, in that section of the country, as there was when you went there?

A. No, sir.

Q. Was the range better or poorer than when you went there?

A. Worse.

Judge FALL. That is all.

And now, at this the hour of 12 o'clock noon, an adjournment is had until two o'clock p. m. of the 16th day of December, 1899.

917 Pursuant to adjournment the hearing and trial of this case is resumed.

Present as before.

Judge FALL. We have been waiting for Mr. Carpenter and Mr. Reed, and while they are absent there is another little branch of the inquiry that we might take up.

F. C. BARKER, another witness on behalf of the defendants, being called, and having been duly sworn to testify the truth, the whole truth, etc., on being questioned by Judge Fall, said on

Direct examination:

Q. Please state your name, age, residence, and occupation.

A. My name is F. C. Barker; 54 years of age; residence in Las Cruces; my occupation is that of grower and shipper of fruit and vegetables.

Q. How long have you resided in Las Cruces?

A. Nine years.

Q. Do you know the different irrigation ditches in what is commonly known as the Mesilla Valley, in and around Las Cruces?

A. Yes.

Q. Can you name any of them?

A. The Doña Ana, the Las Cruces, the Mesilla, Chambiari, La Union. There are others. I don't recollect all of their local names.

Q. Do you know of any irrigating ditches below the Mesilla Valley, in or near El Paso?

A. Yes, sir; I have seen the irrigating ditches below El Paso.

Q. Do you know of any above the Doña Ana ditch, which you have named—above the Las Cruces ditch, and below Elephant Butte?

918 A. Yes; I have visited the acequias between Rincon—near Rincon in the Lamparde, Colorado district.

Q. From what you know, have you observed the flow of the river?

A. Yes, sir.

Q. During the last nine years?

A. Yes.

Q. Have you ever had any official connection with irrigation in this valley?

A. Yes, sir; I was president of the ditch commission in Las Cruces in 1896, 1897, and 1898.

Q. Have you ever made any official report of any kind upon the irrigation and its conditions in this valley or elsewhere?

A. Yes, sir; I was engaged by the Government to write a bulletin on irrigation in the Mesilla Valley.

Q. From what you know of the flow of the Rio Grande, and your observation as to irrigation—your knowledge of the capacity of the ditches below Elephant Butte, including the ditches which you have spoke of at El Paso, and all the ditches which you have knowledge during the irrigating season—what have you to say as to the average flow of water in the river during what we call practically the irrigating season, being or not already appropriated by individual or community—individual or communities or companies?

A. As a rule, there is throughout a great deal more water than is needed by the ditches, or there is none at all.

Q. What ditches do you have reference to in the particular of having more water than is needed by the ditches—all those ditches?

A. All these ditches, but especially these around Las Cruces.

Q. Have you had any knowledge during this last nine years of times during the different years, and each of them, when parties above or below a given point within these limits which you have named might have water for irrigation and those next below wouldn't, from the waters of the river?

A. I should add to my last answer: Of course there is a period between a plentiful supply of water and none at all in which there
919 really is not enough for the ditches, yet there may be some in the river. I have seen times absolutely when we have been able to irrigate here, and when there has been no water fown in El Paso.

Q. Then you have seen the time when you have been able to irrigate through the Mesilla, Las Cruces, or Doña Ana ditches, when the people of Chamberia or La Union were unable to irrigate because there was no water in the river?

A. Yes, sir.

Q. The question that I directed your attention to first was *as to* not as to whether when it first came down, or any particular period, but the average flow. Of course, that would include the water which passed, as well as the water which did not pass, and which was used by these ditches, making the average of it. Such average flow during the irrigating season proper would average so that it would come along towards the last from the river itself, after you had been irrigating one or two or three months—irrigating that length of time—the river would gradually decrease, would it not?

A. Yes, sir.

Q. What would say as to the average flow of water being all appropriated in average years during the irrigating season?

A. There is a great excess.

Q. You said that sometimes when the water comes there is more water than you need in the ditches?

A. As a rule there is more water.

Q. And then towards the end, or when that water is getting down, they may be still getting water up here and the other ditches further down get none; now is that during the average flow of the river, during the particular periods known as the irrigating season?

A. While the river flows?

Q. Yes; while the river flows?

A. There is a great excess of waters while the river flows.

Q. When it comes, does it come in floods, or regularly; how do you mean?

A. Part of the season it will be in flood, and part of it will be an average flow.

920 (No cross-examination.)

L. G. CARPENTER, another witness on behalf of the defendants, having been duly sworn to testify the truth, the whole truth, and nothing but the truth, on being examined by Mr. Hawkins, testified as follows:

On direct examination:

By MR. HAWKINS. Please state your name, age, residence, and occupation.

A. My name is L. G. Carpenter; age, 38; residence, Fort Collins, Colorado; occupation, professor engineering in the State Agricultural College of Colorado, and also connected with the experimental station—director of the agricultural experimental station.

Q. Does the agricultural experimental station have anything to do with the gathering of statistics and experiments with the usage of waters in the flow of streams; if so, what? State, generally, the character of it.

A. Yes, sir; it has carried on quite an extensive line of experiments in the use of water for irrigation, on the loss of water from ditches and streams, and on the amount of water used, as well as the measurement, or the calculation of it. I have had charge professionally.

Q. Have these experiments been carried on under your direction and control?

A. Yes, sir.

Q. For how long a period?

A. For eleven years—ten years. I think the first practically was in 1889. I became connected with the institution in the fall of 1888, and the work—began work in 1889.

Q. Then you personally carried on portions of that work?

A. Yes, sir; greater part of it, or a great part of it.

921 Q. You say that it embraced a study of the loss of waters through seepage in streams. Were these streams always situated in the State of Colorado?

A. Yes, sir; all those that we—that I have personally measured, or those that have been measured by our subordinates.

Q. Then you have superintended or conducted an examination into the question of the loss of water of the Rio Grande River in the State of Colorado; at what point therein; if so, by seepage; if so, what point?

A. We have measured the Rio Grande for that purpose at different times, from what is known as the gauging station above Del Norte to the State line, or close to the State line.

Q. What distance is that?

A. That distance is about 100 miles. I can not give the exact distance; there is something over 100 miles; I don't recollect just what.

Q. What is the shortest stations between which you have taken these measurements on that river?

A. Well, the two closest together are perhaps—been at what is known as the gauging station and the bridge at Del Norte.

Q. What is that distance?

A. That is something less than two miles—approximately three miles.

Q. Something less than three miles?

A. Yes, sir.

Q. When did the observation with reference to the loss of water by seepage within that distance of something less than three miles commence?

A. We first made a measurement of the second station a year ago, although previous measurements had been made at the upper point. The measurements were repeated this season.

Q. Please explain to the court how these measurements were taken and the results ascertained—that is, method of making the measurements.

A. Yes, sir; the method of making the measurements is the same as usually used in gauging a stream—that is, we have an instrument
922 known as the current meter, with which we determine the velocity. The distance across stream is determined, and the depths are found at regular intervals—in this case, at every two and five-tenths feet distance. This measurement of depth and distance across gives the cross section of the stream. The velocity of the stream is determined by the current meter at intervals corresponding with depths, so that we know in each particular portion of the stream its area and the velocity of water in that particular area. The product of this then gives the quantity of water flowing by that particular section of the stream, and all of these portions added together gives the discharge for the whole stream at that point, and then we carried the measurement at that point, and then measured all the ditches that take out between that and the next point of measurement, and of the streams running in. At the second section in this particular case the method was the same. The meter that is used is known as the horizontal meter, sometimes called the Colorado meter. We usually call it the Lalie meter—that is, whose accuracy is tested by what we term ratings. We hav'n't rated any previous to this year, but I rated it shortly afterwards. This rating agreed with the ratings that I made of the same meter in the interval of ten years. I think we have had it over ten years, and the ratings have agreed, or either they come very closely, so that I use the same. What I mean, the same reading table that I have used for two years back.

Q. Please state what percentage, or rather the number of cubic feet—second-feet—which, by these observations so conducted, you ascertained were lost by seepage from the body of the stream between these given points of less than three miles apart, in each year.

A. Last year—it was 1898—it was the first date at these points, the loss was 51.69 cubic feet per second.

Q. At what flow of water?

A. I don't know that I can give that exactly—the exact flow. I think it would be about 250 feet last season, and this year the loss was 61.96 cubic feet per second—practically the same body of water which was taken. Both measurements were taken in August.

923 Mr. CHILDERS. From what distance is that?

A. Approximately three miles. It is really something less.

Mr. CHILDERS. What did I understand you to state—at what flow?

A. I can't give the exact quantity. I stated, approximately, about, as

I recall, 250 feet. I am very sure that is the case last season, and I could determine that, because I think I have those notes for last year.

Mr. HAWKINS. We will ask you to look them up after you are through?

Q. I understand you, then, that these amounts were lost from the flow of that stream by seepage, after all other diversions and diminutions were accounted for?

A. Yes, sir.

Q. And was due entirely to the seepage from such stream?

A. Practically so, the evaporation would be insignificant.

The COURT. I understand that is about one-fifth of the quantity of the whole quantity passing.

Judge FALL. About one-fourth.

Mr. CHILDERS. Nearly a third.

Judge BURCH. 61 in 1896 out of a flow of 250?

WITNESS. I don't recall the exact amount.

Mr. CHILDERS. What is your best recollection about the flow of the waters?

A. 240—about 240 to 260. That is for the last year—the season before. That is my recollection, but I have the record of that here.

Mr. HAWKINS. Q. Was the Rio Grande between those points, during the years in which the measurements were made, a perennial flowing stream?

A. Yes, sir.

Q. Has it always been a flowing stream?

A. Always, since I have known it, and all that I have ever heard of it.

Q. Have you ever made any calculation with reference to the rainfall area tributary to the Rio Grande River below the points known on the map as Elephant Butte, about 125 miles above El Paso, down to the mouth of such river?

A. Yes, sir; I have made it from the map that hangs on the wall—Land Office map.

Q. Please state the official title of that map?

A. That seems to be the map of the United States and Territories, prepared by the General Land Office, but I didn't make it from here.

Q. From that map?

A. These calculations were made from a map of that kind.

Q. What did you ascertain that area to be?

A. Well, as well as could be told, from the limit of the watershed, from that map, including the portion south of the Elephant Butte dam in Mexico and in Texas (this includes the Pecos River) the total watershed was 270,000 square miles. Out of this, it should be stated, there possibly should be taken some which it is doubtful if it flows into the Rio Grande—it doesn't flow into any other stream—that means from between 70,000 and 80,000 square miles. About 75,000 as close as I can determine. The last measurement is not quite as exact as the former. Rainfall, an area of 195,000 square miles, that seems to run into the Rio Grande below Elephant Butte dam.

Q. Will you please give us the result—did that include the measurement entirely to the mouth of the river, or did you exclude any of the territory?

A. That includes all of that to the mouth.

Judge BURCH. I didn't hear that last question.

A. It includes all of the portion down to Brownsville, or to the mouth.

Judge BURCH. In other words, from Elephant Butte?

A. Yes, sir.

Mr. HAWKINS. Q. What proportion of that is above, north of, Rio Grande City—on the east and west line, is that place you indicate on the map? Don't care for it accurately.

A. I think there would be—I was trying to think. I believe there is about 10,000 or 12,000 square miles below that. I am not sure of 925 that last figure, but the others I am sure of. It was not a very big amount.

Q. Will you give the result of your examinations of the loss from the Rio Grande between the other measuring points, than that which you have described, within that 100 miles to which your examinations were confined, by seepage?

A. In that distance, after passing the second station, we then found generally a gain for the next thirty miles; that is, in round numbers. There are gains at places and losses at places. From Alamosa down, there has generally been found to be a loss, but the gains in that extent from Del Norte to Alamosa are not, as a rule, quite as great as the losses in the section of three miles above.

Q. To what are these gains attributable?

A. These are attributable to the irrigation of the lands in that vicinity. The losses from ditches and seepage from irrigation water.

Q. These gains—

A. I can give that in detail if you desire it further.

Q. Very well; it is interesting, and I expect the court would like to have it.

A. From Del Norte to the Prairie River in 1898 there was a gain of 2.11 feet, and in 1899, 10.28.

Q. Give the distances.

A. I have not got it noted; I think it must be about 12 miles. My distances there will be unreliable. From Prairie canal to the Monte Vista bridge, 6.26 feet gain in 1898; 2.46 feet in 1899. From Monte Vista to the Neilworth ditch, 8.82 feet gain in 1898, and 24.73 gain in 1899. From Kenilworth ditch to the Hickory Jackson ditch, a gain of 18.10 in 1898, 36.10 in 1899. From Hickory Jackson ditch to Alamosa the gain was 2.78 last season, and loss this season of 13.78 feet. From Alamosa to the Conejos River, a gain of 1.57 in last season, and loss of .06. This year also balanced, and from Conejos to what we speak of as the Lava Cañon, or sometimes the Small Cañon, the river narrows 926 out into a deep gorge, and this is taking it at the upper end, a loss last season of .92, and this year a slight gain of .38 of a foot. And then from there to the State line it is through a cañon of volcanic rock. Last season that distance was not measured. It is very difficult to access. This season in that distance, we found a loss of 1.78 feet. So a total loss last season of 13.72 to the mouth of the cañon, and this year a loss of 6.27 feet down to what is known as the State Bridge; that is a few miles north of the State line—about six miles.

Q. This gain or these gains were in the nature of return waters from waters that had been upon irrigated lands adjacent to the stream?

A. Yes, sir.

The COURT. Then the total loss from diverting the waters from this stream for 100 miles was something like 6 and some feet a second—second feet?

A. Well, these measurements are taken, after allowing for the amount of water diverted and accounting for, allowing for all the water that is seen to flow in, that we can find coming in.

Q. The net result at the end of the hundred miles of the territory is a loss represented by these figures named, that you have stated and in that list there?

A. Yes, sir.

Mr. CHILDERS. What does that amount to in 100 miles?

Judge BURCH. I think we might get mixed up in this manner.

Q. How did you account professionally for the very great loss in seepage from that river between the two stations which were less than three miles apart?

A. The river passes over a sandy bed intermixed with boulders; that is, a mountain river bed, where the river has been reduced in fall to a moderate amount, probably thirty or forty feet to the mile.

Q. Does not all that water return to the channel of the river?

A. Well, these measurements would seem to show, yet we have never been able to trace it back inside of the State line.

927 Q. You then attribute the occasional increase between the measuring points—are all these measuring points below that point where the great loss commences?

A. Yes, sir.

Q. You then attribute the occasional increase between the measuring points lower down entirely to the return waters which had been used for irrigation?

A. Yes, sir; with a slight exception, which cuts no figure. There are artesian wells in the valley, quite a large number of them. They are in fact small and their aggregate flow is very small. They may act to some extent on the water, but they cut no figure at all in the return to that stream.

Q. Have you conducted other experiments with reference to the return waters which have been used in irrigation upon any of the other streams in the State of Colorado?

A. Yes, sir.

Q. What streams?

A. We have carried on such measurements on the Cache a la Poudre River, on the South Platte, on the St. Vrain Creek and its tributary the Left Hand Creek, in the Big Thompson and its tributary, the Little Thompson, on the Arkansas River for a distance of 200 miles, and on the Rio Grande, which I have mentioned.

Q. For how long have such experiments been carried on, generally, under your charge?

A. The Poudre has been longest the subject of measurement. It has been measured for thirteen or fourteen different years—thirteen or fourteen different times—all since 1889, with the exception of one. The first

two were not conducted by me, the others have been. The Platte has been measured, I am not sure the number of times, seven or eight times, don't know but nine or ten. About half of them have been made by me or under my direction. St. Vrain has been measured twice. The Big Thompson has been measured three times. The Arkansas has been measured three times.

928 Q. Have you seen the facts which you have ascertained from these measurements with reference to the return waters from the Poudre?

Judge BURCH. To which I object; we had that out in the Red River matter.

Judge FALL. We will go into the Red River matter as much as you please.

The COURT. The objection will be sustained.

(To which action of the court in sustaining the said objection defendants excepted.)

Q. Will you please state that drainage area of the Rio Grande below Elephant Butte?

A. The net area, I believe out the uncertain area which seems to sink to a great or less extent, I think was 195,000 square miles; that was from Elephant Butte to the mouth and above Rio Grande to the mouth; I don't know that I made an estimate of that. It was not a very large sum.

Q. From Rio Grande down to the mouth?

A. Yes, sir; as I recollect; it was ten or twelve thousand miles.

Mr. HAWKINS. That is all. I believe there is a calculation I didn't call for, the drainage area of the Rio Grande between Elephant Butte and El Paso, Texas?

A. It was between five and six thousand square miles.

Mr. HAWKINS. That is all.

Cross-examination:

Examined by Judge BURCH. I frankly confess to the court that a good deal of this is Greek to me, and I would be glad if the defendants have any other witnesses to have a little chance for this to percolate through my mental system.

Judge FALL. Seep in.

929 Judge BURCH. And to prepare for the cross-examination, either by myself or associate counsel, of Professor Carpenter. There are some few simple questions that might occur to anybody, but I would be very glad to have an opportunity to cross-examine him later.

Mr. HAWKINS. We will have no objections.

(Cross-examination postponed.)

W. M. REED, another witness on behalf of the defendants, having been duly sworn to testify the truth, etc., on being examined by Mr. Hawkins, testified as follows:

On direct examination:

By Mr. HAWKINS. Please state your name, age, and residence.

A. W. M. Reed; thirty-five; Roswell, New Mexico.

Q. What is your occupation?

A. Civil engineer.

Q. Are you connected with any irrigation company? If so, how long have you been so connected?

A. Connected with the Pecos Irrigation and Improvement Company; chief engineer; I have been connected with the irrigation enterprises in the Pecos Valley for—since May, 1889.

Q. Has your connection been continuous?

A. Yes, sir; with the various companies; not with one company all the time. There are two companies there, and I have been with either one or the other all the time.

Q. What has been the general scope of your duties in your employment by these companies as an engineer?

A. Everything in connection with the engineering of such companies as far as the location of ditches, construction of canals, dams, measurements of waters, and the actual supervision of the delivery of waters to consumers.

Q. To what extent have you made measurements of ditches, river channels, and flows of water?

930 A. I have had this to do all the time that I have been there—not constantly measuring water, but each year I had more or less of it to do.

Q. Have you ever been at the head of the Concho River, at its junction with the Rio Grande?

A. At its mouth with the junction of the Rio Grande?

Q. Mouth of the Concho with its junction? If so, when?

A. I was there December 8th, 1899.

Q. Just a week ago to-day?

A. Yes, sir; I got there on the 7th and left on the 8th.

Q. Did you make any measurement at that time of the bed of the Rio Grande River at that place?

A. Yes, sir; just below the mouth, and above.

Q. Just below the mouth of the Concho?

A. Yes, sir; and above the mouth of the Concho.

Q. How far below the mouth of the Concho did you make a cross section of that river bed?

A. I should judge between one and two miles, somewhere, below. That is by the course of the river.

Q. Who was with you?

A. Mr. Daly—R. C. Daly—and three Mexicans. I don't know their names.

Q. What cross areas did you take?

A. I took a cross section below the mouth of the Concho from the indicated high-water mark—not only as indicated by the rubbish and float that was deposited on the bank, but as pointed out at other points by Mr. Daly—which I checked with my instrument.

Q. Did you take a cross section also of the high-water mark of the Concho at that place?

A. No, sir; the Concho was in the river at that time and I measured up there. It was below the mouth of the Concho.

Q. That is what I mean. Did you take at the same place on the 931 Rio Grande a cross section of the high-water mark of the Concho?

A. Yes, sir; I took the cross section of the highest water mark made—highest water mark made by the Concho and by the Rio Grande.

Q. Who pointed out to you the high-water mark of the Concho across that river bed of the Rio Grande?

A. Mr. Daly and a Mexican—not one of the three that was with me, but one who lived there. He came to us as we crossed near his "jacal," and he and Mr. Daly pointed out the high-water mark that the Rio Grande proper would reach unaided by the flood from the Concho.

Judge BURCH. That was above.

Mr. HAWKINS. No; it was below, in the river bed itself.

Q. Who held your lever rod for you in determining these areas?

A. Mr. Daly.

Q. Was Mr. Daly with you when you went up above the junction of the Concho and the Rio Grande in the bed of the Rio Grande to take the cross section of it?

A. Yes, sir.

Q. Who held your lever rod while you took that cross section?

A. Mr. Daly.

Q. Will you please now state the area of the cross section which you took in the bed of the Rio Grande below the mouth of the Concho, both of the high-water mark of the Concho and the high-water mark of the Rio Grande as pointed out to you by Mr. Daly?

A. (Witness produces plat and map of cross section referred to.) You want all the various cross sections I took there? I can give it here as I have it. Cross sections are of the water that was in the river that day. 163.3 of cross sectional of water. Of high water of Rio Grande proper, as indicated by R. C. Daly, above present line, 566.4. Cross sectional area in wetted sections, 19,556.7.

Judge BURCH. The second measurement was what?

A. 566.4.

Judge BURCH. Hundred, or five thousand?

932 A. No, sir.

Judge BURCH. And the other was 19,956.7?

A. Yes, sir.

Mr. HAWKINS. Q. What did this 19,956.7 represent?

A. It represented the entire cross section from the high-water mark on one side, as near to the right angle of this axis of the river as possible, to the high-water mark on the other side.

Q. And you say that Mr. Daly had pointed that out to you as the high-water mark of the Concho at that place?

A. Yes, sir; he pointed it out on one side, and as I crossed to the other side to satisfy myself I examined the bank and found the evidence of debris that had evidently been deposited there by water, and it checked up almost exactly. There was only a couple, $\frac{3}{16}$ difference.

Q. You say that in that channel he had pointed out to you the high-water mark as made by the Rio Grande. You say within that channel he had pointed out to you the high-water mark as made by the Rio Grande in its floods?

A. Yes, sir; I asked that question in particular.

Q. And that you measured the same and found it to be 566.4 over and above the water that was then in the river?

A. Yes, sir.

Q. And that there was then in the river 153.3?

A. Yes, sir.

Q. Did you afterwards take any check above the junction of the Concho and the Rio Grande, in the bed of the Rio Grande itself, and make a cross section of that?

A. Yes, sir.

Q. What did you ascertain the area of that cross section to be?

A. I can tell you how I obtained that perhaps, to answer this better. I had three Mexicans with me—two to carry the chain and one to drive. They were men who were apparently familiar with the country—said they had always lived there—and I asked them at this point where I wished the cross section if the water of the Rio Grande proper—they called it there Rio Puercos, but it is the Rio Grande proper—if the water ever got out of its banks, and they all said "No, it did not," the Rio Grande of itself. I then made a cross section of this point. The banks were quite steep, and there was no deposit there. Can't tell anything about it from water marks, so I took the cross section from top of bank to top of bank, and the cross section there was 662.25.

Judge BURCH. Now, respecting this, gentlemen, if you will excuse me. This paper—cross section—can not possibly be a proper line of examination. It was taken upon the basis of the statement of these Mexicans that the water never got above certain banks that appeared there. These Mexicans are not here nor subject to cross-examination, and this matter being of important consideration—in fact, I may say, one of the most important questions in this case—it is entirely improper, in my judgment, to permit such a result, hinging upon pure hearsay of parties who may or may not have known what they were talking about at all, to go in evidence, and I must strenuously object.

Mr. HAWKINS. This has been connected.

WITNESS. I might say that Mr. Daly was also with me at the second cross section.

(Argument.)

The COURT. Where was this other cross section taken; from the place where you took the first one?

A. Three or four miles above the first. The first one was taken below the mouth of the Concho, and then I crossed the Concho and went above.

The COURT. Were you able to discover, Mr. Reed, from your own observation, any physical signs there upon the ground indicating the high-water mark of the Rio Grande yourself?

A. No; I could not, from the fact that since the Rio Grande had come down the Concho backs the water way up the Rio Grande seven or eight miles. As to further than that I could not say, and it obliterated any marks. Easily tell from the deposit of the débris that the last marks had been put there by the Concho itself.

The COURT. I doubt the admissibility of this testimony. The objection will be sustained. I will allow you to put Mr. Daly on the stand to show his knowledge of the high-water mark there.

(The witness Reed withdrawn for the present.)

R. C. DALY, recalled as a witness on behalf of the defendants, on being examined by Mr. Hawkins, testified as follows:

On direct examination:

Q. Mr. Daly, were you with Mr. Reed when he measured the banks of the Rio Grande above where the Concho flows into it to determine how much the area between the banks was?

A. I was with Mr. Reed when he measured the Rio Grande this month.

Q. Both down below and up above the Concho?

A. Yes, sir.

Q. What did he measure up above the Concho?

A. He measured the bed of the Rio Grande.

Q. Does the Rio Grande ever get out of its bed at that place?

A. I never heard of it.

Q. Have you ever known it to get out of its bed at that place?

A. No, sir.

Q. How long have you lived there?

A. Thirty-three years.

Cross-examination:

Examined by Judge BURCH. Q. How many miles above the mouth of the Concho was it where this measurement was taken on the Rio Grande?

A. About a mile; a little bit more or less.

Q. Didn't you say the water backs up some six or seven miles?

A. That is from the Concho.

Q. Concho comes out, and the water backs up six or seven miles.

A. Yes, sir.

935 Q. Now then, suppose the water coming down the Rio Grande should join with the water of the Concho, how could you tell where the high-water mark of one or the other was?

A. I don't suppose I could tell.

Q. Can you tell where the high-water mark of the Rio Grande is at that point? Now, suppose there wasn't a drop of water in the Concho—suppose the water has all gone down in the Concho, and no water there to influence the flow of the Rio Grande, now can you tell how high the Rio Grande flood goes alone from the Concho?

A. About the Concho?

Q. Above the Concho.

A. To my knowledge I have never seen it out of its bank, nor have I ever heard of its being out of its own bank—the Rio Grande out of its own bed, except when the Concho goes up there.

Q. Now, suppose there is not a drop of water in the Rio Grande—

A. Then the Concho will go up four or five miles.

Q. Overflow the banks?

A. The Concho can overflow its own banks. Of course it does.

Q. Now, suppose it backs up five or six miles, and then the Rio Grande comes down; did you ever go to see at such a season?

A. No, sir.

Q. Can you tell what is the high-water mark of the Rio Grande and what is the Concho when its waters intermingle together?

A. I can't tell you anything more than what I have told you.

W. M. REED recalled for further direct examination.

Judge BURCH. I object to the testimony of the witness, Reed, on the ground as stated before.

The COURT. The objection will be overruled.

936 (To which action of the court the plaintiff then and there excepted.)

Mr. HAWKINS. What was the area of the cross section of the Rio Grande above the mouth of the Concho, at the point where you measured the same, as you described?

A. 662.25.

Judge BURCH. The area between the banks, you mean. I object to that.

The COURT. The objection will be overruled.

(To which action of the court in overruling said objection the plaintiff then and there excepted.)

Q. Have you made any diagram showing the comparative areas of these cross sections, as testified to by you?

A. Yes, sir.

Q. Will you please present the same?

(Witness produces profile of cross section referred to).

Judge BURCH. I object to that for the reason—unless it is preliminary for the information of the court—if it is for the real purpose of showing that this is all the water that flows down the Rio Grande; I mean in flood times.

The COURT. For the same reasons you objected to the testimony of the witness, I suppose?

Judge BURCH. Why, yes.

The COURT. The objection will be overruled.

(To which action of the court the plaintiff then and there excepted.)

Mr. HAWKINS. We offer that in evidence.

(The same is marked with the initials of the witness, "W. M. R. No. 1.")

Mr. HAWKINS. That is all.

Cross-examination:

Conducted by Judge M. C. BURCH. Q. You don't know yourself the high-water mark of the Rio Grande at that point?

A. Not of the Rio Grande proper, except as indicated.

937 Q. Nor how much water comes down it at flood or any other time?

A. Except when I measured.

Q. Was there any coming down then?

A. Not a particle.

Q. Did you take the precaution to measure the valley at the place where you made the cross section, between the tops of the banks above the Concho, on the Rio Grande; did you measure—

A. Yes, sir.

Q. Clear across?

A. No, sir; it is too long a distance.

Q. Suppose, for instance—then you have no means of knowing if it ever were a fact, of how much water should pass by?

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A. I drove on the east, on the Texas, side of the river from there to Presidio. Drove down by the mouth of the Concho, and I saw no effect of the water getting out. In some places there is a low bottom, which you call a first bottom, which had been evidently overflowed. I could see indications of that, but the Rio Grande swings in just below where I measured it, against higher ground. I drove right along down there.

Q. Yes, but how wide was the valley at the place where you made the cross sections?

A. There is more or less timber in there, and from down where I was, I couldn't see how wide it was—a consideration width.

Q. Two miles, half a mile?

A. It is at least half a mile.

Q. Now, you didn't have means of knowing whether on the Mexican side it was lower down than on the American side?

A. It was lower.

Q. And did the Concho comes in there?

A. The Concho has low banks as she enters the Rio Grande.

Q. It must be a valley, if that is so. A valley in between the confluence of the Concho?

938 A. I suppose I could have taken the high-water mark of the Concho and run up forty miles.

Q. Not that; I am only seeking for light.

A. I didn't understand your question then.

Q. Well, I want to know what you know about the lay of the land, if we may term it—topography of the land—from between the Concho, where it comes in, and the Rio Grande, where it comes in; they must converge, or do they come in at right angles?

A. They come in, I should judge, not quite at right angles.

Q. Not quite at right angles. Well, then, it makes a triangle possibly, if that is so?

A. Yes, sir.

Q. By running—following up a distance on the Concho—over to the Rio Grande up a distance from the Concho, making a triangle possibly; could you tell me anything about what the lay of the land was in there?

A. Well, as they enter, perhaps—I wouldn't be positive at what angle—they enter, maybe at 50 degrees or more, but the bank for a little distance between where they enter is low land and subject to overflow—that is, the same as it is below; and then the Concho comes down between the point where we measured the Rio Grande—below the mouth of the Concho is a high ridge, upon which is built a town, and passing from that you come down into the Concho and on the Concho bottom where it is farmed. Oh, I should judge I drove across farms there a half and three-quarters of a mile—kind of farms of the Mexicans. And then I crossed the Concho and drove directly across to the Rio Grande.

Q. To the Rio Grande?

A. On the Mexican side?

Q. Yes, sir; well, then, you went right through there?

A. The bank of land?

Q. You did go over it?

A. Yes, sir.

Q. Was that higher or lower than that on the American side?

A. Well, at that point that I measured—I came on over to the American side of the river—there was; I don't rec'on a big bank there.
939 It looked pretty near level. I didn't see as there was any great rise, as far as I could see from the brush and timber.

Q. Sort of shrubbery in there, or driftwood or bushes?

The COURT. What was the character of the vegetation of the banks at such points where you measured?

A. Well, on one side there was a little bit of a far' that wasn't farmed—that is, it had been the year before—was mostly barren, had been farmed; apparently this year didn't plant anything. On the other side they evidently didn't farm much. On the Mexican side right there, very close, perhaps at some previous time it had been in cultivation, but it had been allowed to grow up in bushes.

The COURT. I mean what kind of bushes, or what kind of vegetation on the ground?

A. I don't know what the bush was; it was an undergrowth.

Questions resumed by Judge BURCH. Well, now, if a great flood had come down there and backed up back—I say a great flood had come down the Concho, at a time when there was no water at all in the Rio Grande, and it backed up seven miles—up the Rio Grande, as stated here by somebody, counsel or witnesses, must it not have overflowed there lowlands in the triangle, as you call it?

A. Oh, yes, sir.

Q. Was there any appearance of an overflow there—débris, wash, and all that sort of thing?

A. There were appearances.

Q. How high up on these bushes, and up in that triangle?

A. Not very high. I suppose it had been over all of it. The bank of the land was barren and had been for ages; there was some vegetation.

Q. Well, now, likewise, if the Concho had been at a low stage of water, or none in it at all, and a flood had come down the Rio Grande which would have outrun the banks which you measured in the cross section, would it not have overflowed also?

A. If it got large enough it would.

Q. That is what I mean. Then, so far as that débris or flood
940 in that neck or triangle of land is concerned, you can't tell whether it came from the Rio Grande or Concho?

A. At that point, I don't pretend to say.

Q. On the opposite side it was clear land? No brush on the American side?

A. Went right into the hills.

Q. Narrow valley on one side?

A. Went right up against the hills. At times the river had scoured out parts of the bank and some of the road.

Q. The road was close by the bank?

A. It was just below; we struck it probably within a few hundred yards.

Q. I understand that you didn't discover anything particular one way or the other in that bank?

A. No; I was higher than the water got, ever expected to get, I guess.

Q. Now, will you take your cross section and explain just how it lays?
(Witness explains profile of cross section.)

Q. Now, will you tell us which is the American and the Mexican side?

A. That is numbered on the American side; that is the American side.

Q. Then it is just the reverse from what it should be?

A. I started with the American side and went across. I numbered it as I crossed it from the American side over. These are the numbers beginning on the American side. They represent the total width of the river at the lower cross section.

(Witness explains various parts of cross section, by reference to here and there, which is not intelligible according to notes of stenographer.)

Q. Well, now, you say that there was high land close by on the
941 American side, so that the water couldn't flow out?

A. Yes.

Q. Now, where would you indicate that high land to be?

A. It might be two or three hundred feet further off; I can't tell. I don't understand your question; I thought you wanted——

Q. I want to know how far back at that point it was before the land raised, up here at that very cross section?

A. I can't say that, but I can say this: I crossed there to the American side and started down the river——

Q. From that very point?

A. Parallel with the river, swinging back until I struck the river down there 150 or 200 yards, and there I went right up on the top.

Q. High land? Upon *on* the plain?

A. Yes, sir; swept around these hills.

Q. And from here [indicating on cross section] it was low out for a long distance?

A. I judge it was, over to the Concho; it was somewhere, perhaps a mile across there as I drove across.

Q. Covered with bushes?

A. Part of it was and part of it wasn't.

Q. Any evidence of *débris*?

A. Oh, yes; that had been flooded.

Q. Now, when you made this lower cross section, was that the water which you indicated there by this red?

A. Yes, sir; that is the water.

Q. Was that running water or was it standing water?

A. It was running.

The following questions, to the redirect examination of the witness, were then asked by Mr. W. W. Follett, by consent of counsel:

Q. The question I want to ask is this, Mr. Reed, whether at high water, in your opinion, this was all running water out over this expanse, or just back water? [indicating on cross-section profile, the cross section taken below the Concho].

942 A. It was running water right here. [Indicating on profile.] This is a well-defined channel, and it has got the water marks—this is the Presidio waterworks, right in the bottom, right there. [Indicating.]

Q. What is this over here?

A. This land is farmed sometimes.

Q. From your station, this one here——

A. About 10 that would be.

Q. From your station *ought* to station 10 of this cross section, below the Concho, would you say in high water, from appearances there, there was a current, or was it backwater?

A. It has a current in here undoubtedly. Yes; a little dead water, simply the seepage.

Q. Now, from station 10 to station 14 plus 50, is there a current in high water; or should you say is that practically backwater over that land?

A. I should judge that was a current, especially in this depression; that is undoubtedly a current, this depression at section 11.

Q. From station 18 to the end of the cross section at station 29, what would you say about that?

A. Some of that it is evidently been overflowed, as it left *débris* settled all around here [indicating].

Q. Settled downstream?

A. Spread out—caught on the bushes.

Q. Then really over this small area from section 18 would probably not carry very much water in high water?

A. It would run a dead current.

Redirect examination:

Mr. HAWKINS. Do you belong to any engineering society or association; if so, what is it?

A. No, sir; I do not.

Q. How far up the channel of the Rio Grande above the mouth of the Concho did you go while on that trip?

943 A. No further than the cross section.

Q. Was there any water in the Rio Grande?

A. Not a particle—to drink.

Q. Where was the water which you have marked on this map?

A. At the cross section below the mouth of the Concho.

Q. Where did that water come from?

A. That was from the Concho, because I crossed the Concho immediately after and saw the water.

Q. Have you made any measurement of the drainage area of the Rio Grande below Elephant Butte, or any calculations?

A. Why, I made a sketch from the map. It was—I calculated everything, didn't take out anything for possible sink of waters there, as Professor Carpenter did; I made it 287,000 square miles, not deducting anything from a portion of the country which appeared to be a basin.

Q. Not deducting anything which appeared to be a basin?

A. Appeared to be a basin and not a drainage.

Mr. HAWKINS. That is all.

R. C. DALY (recalled):

Questioned by Judge FALL. This line that you showed Mr. Reed with these Mexicans, and helped him to measure below the junction of the Concho with the Rio Grande, did the water run over all that part of the country or would it back water?

A. Running water.

Q. Running water clear across?

A. Clear across.

Q. You know that of your own knowledge?

A. To the extent that I lost a son, killing himself in trying to save my house from the inflow of the river.

944 Judge FALL. That is all.

Mr. HAWKINS. We rest our case, with the exception that we wish to have made a part of the record certain quotations from the report of Major Emory, made in 1856 or 1855, to Congress, being entitled the First Official Survey of the Rio Grande from its mouth to El Paso.

Judge FALL. We will read them during the course of the argument, and the quotations can be copied into the record. With that exception our case is closed.

Judge BURCH. Professor Carpenter has not been cross-examined, and at this time it might be well to go ahead with that.

Judge BURCH. We will recall Professor Carpenter for cross-examination.

Prof. L. G. CARPENTER (cross-examination):

Questioned by Judge BURCH. Now, relative to the circumstances which you have detailed as having occurred upon the upper waters of the Rio Grande in Colorado, I want to have you, if you can—not for want of your ability, but for want of my ability to comprehend, perhaps—make clear the processes which you went through, as well as the local conditions which obtained in the places where these processes occurred. If I understand correctly from this, you went down to a certain point in the State of Colorado, which you have named here, and began your experiments, and there you opened out a sort of debtor and creditor account with the river—that is, you practically—it amounted to that—you credited or charged the river, you might say, with what water you found in it.

945 Which did you do, credit it or debit it?

A. Didn't open it under those terms.

Q. Of course not.

A. Simply charged the river with that much water to account for.

Q. How much was that, now?

A. I find, after getting the record, that the amount was 423 feet for 1899. It said it was about 260.

Q. Now, that water was running past that unpost point where your process began?

A. Yes, sir.

Q. Now, coming down; what was the next step that you did?

A. There is a small stream that empties into the river.

A. Added that?

A. Added that.

Q. How much was that?

A. 2 cubic feet.

Q. What was the next step?

A. Then we came to a ditch that took out water. Then we subtracted that; that left so much water, about 2½. Then to another ditch which carried 174 feet.

Q. Take out that much water?

A. Yes, sir.

Q. Subtracted that again?

A. Subtracted that again. Then that accounted for 177 cubic feet per second.

Q. Leaving a balance?

A. Leaving a balance. I did not have the subtraction here. Then we measured the river. The river then ought to have—supposing no gain or loss—ought to have been the difference between these two aggregates, but we found that instead of having that we only had $186\frac{1}{2}$ cubic feet per second.

Q. Which was a loss?

A. Which was a loss of practically 62 feet— $61/92$.

Q. Through some process or other?

A. Through inconceivable sources.

Q. Now, just there let me ask you, what date did this occur?

946 A. On the 19th day of August.

Q. But at the time was the river high?

A. It was relatively high.

Q. Hot weather?

A. It was during the month of August.

Q. And more or less evaporation?

A. Some evaporation, certainly.

Q. Now, that was the point where you acquired your first loss and your only loss?

A. No, sir.

Q. Well, go on?

A. The next point of loss, after you—

Q. Well, go on through the process; we want it in detail.

A. Then that was on Saturday the 19th. Then on Sunday—

Q. That all occurred on one day?

A. Yes, sir; the measurements were made just as close together as it was possible to make them. The river rises and falls so that it necessarily doesn't agree with the average for the day. Then on Monday morning the work was taken up at the place we stopped—the work was resumed at the place where it was stopped on Saturday evening, and another measurement taken at the same point, and then at that date the river was 167 feet.

Q. The same as on Saturday evening?

A. No, sir; less.

Q. How much less was it?

A. Nearly 20 feet; 19 feet and a fraction.

Q. Well, go on.

A. But then a ditch known as the John Brey ditch—2 and some fraction feet, that was taken out. The Rio Grande ditch followed with little over one foot; then Kirkeales followed with little over three feet taken out. Then Rio Grande No. 1, 4 feet; John Off ditch, 5.9 feet. Then the river was measured in this case in two channels, a total of 146 feet and a fraction—

Q. Now does that gain or lose?

A. That shows a gain of 5.75 feet; that was on the 21st.

947 The COURT. Let me interrupt. How did you account for that amount at that point?

A. That is below the ditches; the first three miles is above the ditches. Judge FALL. In other words, this gain is made up of water which was taken from the river at a point higher up and again returned to its channel by means of seepage?

A. Yes, sir; now, then, in the section from Off's—next section— Judge BURCH. Wait one moment. Now go on in detail.

A. From here, then, to Vors.

Mr. CHILDERS. What was the total?

A. 146.16. The Vors ditch, .36; the Hall ditch—

Mr. HAWKINS. Is the mileage between the measurements on the table?

A. I haven't it here.

A. The Hall ditch, 1.12; the McIntosh, 5.13; the Robert's ditch, 1.84; the Silvia ditch, 45.07, and a branch of the Silvia ditch that is tabled here at 3.75; the Atencia ditch, .48, and then we found a return of some water coming into the river.

Q. You then took a different measurement?

A. These were all different measurements, but we measured the water coming into the river.

Q. How did it come in; in some solid form?

A. Came in in a visible stream. A stream running in—a size that could be seen and determined.

Q. Well, you say that that stream came from return waters?

A. No, that was not; that is not counted as return water, that is excluded.

Q. That—they came in together; you credited that.

A. We credited that; yes, sir. The only exception, occasionally a stream enters where we know or have reason to know that this is an accumulation of seepage water coming in from springs. But in this case it was waste water solely—over 1 cubic foot and ten-hundredths. 948 Then Peery ditch, 8.64; McDonald's ditch, a slight leakage, estimated at .01, that makes —; then the river was measured and found to be 85.39 cubic feet per second, which leaves a gain of 4.53 if the addition is correct. Then we start with this sum. Now, on there is some waste in the river. From Silvia, 3.65 inflow, that outtakes in several canals. The Monte Vista Canal, 25.13 — 38.72; Hubbard ditch, 2.34; Butler ditch, 4.26; Fish ditch, .62; the Nickel, .72, and a stream enters the river, 2.66. The river was again measured, wherein it was found to be 22.38. This was above the Monte Vista bridge, leaving a gain of 2.46. Then starting the next morning with the river at this same point, which was remeasured, there having been a slight change during the night—21.36, decrease of a foot during the night. The Patterson ditch comes next with 1.44 outtake. Then comes two sloughs in the river, bringing water in, charged to the other side of the account. Generally, if we have any reason to know, we generally count them as seepage. I should have to add them, to be sure, which I have been in this case. The two sloughs have 1.34 and 6.36. Then the Empire Canal, 15.46 outtake; Centennial, 1.05; St. Louis Canal, 22.17; Kenielworth, .58; and then the river is again measured, finding only 5.29 cubic feet per second, and the river at the bridge was the other way. The amount taken out of the river shows a gain of 24.73 feet per second in

that distance, and still a loss from the first point of measurement of practically 25 feet—24.49 feet. Then, next, starting from that point, we next measured the Excelsior ditch takeout of 5.65; the Costilla, 8.92; the Hendrick Jackson .08. There was no visible inflow and there was in the river 26.74 feet—cubic feet per second. You see, notwithstanding the outtake it was considerably more than when we started—what we started with—a gain altogether of 36.10 cubic feet per second in this distance. Then between the next two points of measurement no ditch or anything. Starting with 26.74, the river at Alamosa had 12.96 per second, a loss of 13.78, and the next measurement of the river below Alamosa was 12.96. The next measurement above the mouth of the Conejos, 10.32. I would say that the ditches in between were in no-wise dry. Water in one or two. A loss of 2.64 feet at the Conejos. Then the river starting at that point again, that is, the same date, the Conejos above the mouth of the Conejos 12.32, and then the two branches of the Conejos bring in a total of 18.69 cubic feet per second inflow, the sum of which would be 29.01, and the river below the Conejos we measured at 28.95 almost—I don't know the exact sum.

Q. How far below?

A. Just below the South Branch. The loss is .06, and between that point and the little cañon, a gain of .38. In other words, the river at the cañon below Las Sozes had 29.33 cubic feet per second, and the next measurement was at the iron bridge near the State line, where the river showed 27.55, a loss of 1.78 in that distance.

Judge BURCH. If the gentleman and counsel have no particular objection, I would like to have Mr. Follett ask a few questions.

Questions propounded by Mr. FOLLETT: Where that loss was in that first three miles, what was the nature of the formation?

A. The bed of the river is all gravel and boulders.

Q. What does it show on the side of the banks?

A. On the north side, as you get down a little ways, is a strata of stone, sort of pudding stone, as I remember now, most all granite boulders and boulders of various sizes that are scattered in the matrix. Above that, the rock at the gauging station is of a little different character. On the left-hand side of the stream the rock is quite close to the channel. Right-hand side it is back some distance, that is, possibly a mile or more; at Los Pinos the stream comes in there.

Q. But you say that in the bed of the river it is heavy boulders and gravel?

A. At the gauging station it is; all the small gravel is washed out, and left them as large as your fist.

Q. How is it below there in the next three miles?

A. There is some sand as you get below there, so that as you get to the head of the Del Norte Canal there is a good deal of sand.

Q. Now, where this seepage return comes in, as you have shown, how far back from the river, approximately, does the cultivated land extend on each side?

A. On the south it doesn't extend back very far. On the north side there isn't much cultivated land, but there, there is this one ditch—the Del Norte ditch—which has a very rapid fall, and according to their measurements the loss from that would apparently be considerable.

Q. The loss is pretty large? Was there much gain in that first section?

A. About six feet.

Q. Now, the next section?

A. Taking that section down to Monte Vista, that was the one that had the most gain, or just above Alamosa. From Monte Vista to Alamosa is the greatest gain.

Q. How far back from the river does the cultivated land extend there?

A. Well, forty miles on one side, you might say.

Q. But it don't all slope towards the river—towards that portion of the river?

A. No, sir. Well, the underground water may not follow the surface water—not necessarily. The slope is such that, while in all probability it goes the same way in that section, the portion that comes in that section—I am hardly able to say how much—probably comes from as far back as the San Luis Canal.

Q. How far is that?

A. That runs back north of Alamosa—is probably eight miles. Yes; it runs back further than that, probably as far back as the Farmers' Union Canal.

Q. Eight or ten miles to the north that you feel pretty sure the underground water would slope to the river?

A. Yes, sir.

Q. And a greater proportion of it north?

A. Yes, sir.

Q. How is it on the south?

A. I am not speaking of that part where the greatest amount of cultivated land is. There are large tracts of uncultivated land on the south. There isn't anything like the amount of water used on the south side as there is on the north. Comparatively little.

Q. Well, first, what is the slope of the surface, approximately? How much does it rise per mile, say, going back to the north there, towards the Farmers' Union Canal from the river?

A. In that part it slopes away from the river, down hill.

Q. Yes; how far?

A. The lowest point is on the Rio Grande Railroad; is north of Hooker. I think about fifteen miles north of Alamosa.

Q. Which line is that? The one that comes from Monte Vista to Alamosa?

A. No, sir; from Alamosa to Poncho Pass.

Q. What is the slope of the surface of the ground from the river up towards the Farmers' Union or San Luis from or near Alamosa and Monte Vista?

A. I have or did have a little map that I could show you the lay of the country very plainly. We have a map of that valley showing the contour lines. The land slopes. There is a hill to the northeast. The Del Norte Canal runs almost directly away from the river. The slope east and west is above the line of the Rio Grande Railway from Alamosa to Poncho Pass, or Salida, and is about 7 feet to the mile, east and west. North and south the slope is slight. I don't recall just what that is. A 7-foot slope extends up to about north of Monte Vista.

Q. What is the nature of the soil and the subsoil?

A. The soil is sandy, with clay in it. From Monte Vista west it is very largely what might be called river wash. As you go down below the surface soil a foot or so you strike into boulders of the size of your fist, and then as you pass east from Monte Vista two or three miles it runs into a much more finer soil on the surface. In fact, the old lake bottom shows at intervals of a few miles as you travel along the road until you reach the railroad north of Alamosa.

Q. What does the subsoil show where the ditches come in?

A. North of Monte Vista it is sand, or this boulder gravel.
952 The ditch that is taken out near north of Alamosa—it strikes a hill—and they have cut it down for some depth, and it passes through quite a large amount of clay. It varies at different points. Some places that clay extends for quite a good many feet, and that is the whole formation of the valley—of 1,100 feet is clay beds.

Q. North of Monte Vista you say there is all gravel?

A. Principally gravel; yes, sir. Here is the map I was looking for. It might add, to answer one of the previous questions—simply to make it a little more accurate—the answer that I made for the section north of Alamosa up to Perry ditch. The slope of the land is almost directly east and west for a distance of twelve miles north of Alamosa.

Q. Is there any likelihood, in your opinion, from anything you know there, that any of that gain which you showed at different places might have been from springs in the river that existed there before the irrigation commenced?

A. I found no gains from any springs anywhere, nor the river, except what is seen to be attributable to the gain from irrigation.

Q. And was there any likelihood that any of the gain that you showed in your measurements was due to rainfall?

A. No, sir; I think not—not there.

MR. FOLLETT. That is all.

Redirect examination:

Judge FALL. In this distance of 3 miles or 2.8 miles, where this great loss occurred, were there any ditches taken out of the stream there at all?

A. Yes, sir.

Q. And in making this estimate of loss you have estimated the ditches of course?

A. We have allowed this loss.

Q. This loss on account of the disappearance of the water, you don't know how that occurs?

A. Not from any visible sources.
953

Judge FALL. That is all.

And now at this hour an adjournment of the hearing and trial of this cause is taken until Monday morning, December 18th, 1899, at 9.30 a. m.,

And now this the 18th day of December, 1899, at the hour of 9.30 a. m., pursuant to adjournment taken on the previous Saturday, the hearing and trial of this cause is resumed.

Present as before.

MR. HAWKINS. We would like to have the right to recall Mr. Harroun for the purpose of examining him with reference to the data submitted to him the other day, his gauge measurements of the river.

MR. CHILDERS. I suggest you had better do that now.

P. E. HARROUN, reintroduced as a witness on behalf of the defendants in this cause, on being questioned and examined by Mr. W. A. Hawkins, esq., said—

Direct examination:

Mr. HAWKINS. Mr. Harroun, in the data which you submitted the other day on your direct examination, and which was filed with your cross-examination, there appeared a comparative table of the flow
954 of the Rio Grande during several periods, as between San Marcial and El Paso, in which the comparison was made—in which the table of the El Paso discharge was given as three days later in each instance than that of San Marcial, or was that distance allowed in the comparison?

A. The interval of time?

Q. Yes, sir.

A. That was a supposition that the water would take that long in passing from San Marcial to El Paso.

Q. What was the distance allowed by you as between San Marcial and El Paso, that the river would flow in that length of time?

A. About 175 miles along the axis of the river.

Q. Now, will you please take your report of the flow of water at San Marcial in 1897 and its flow at El Paso during the same year, and state from the data which you have submitted what the difference between that flow appears to be on October 1st, 1897?

A. Between San Marcial and El Paso?

Q. Yes, sir.

A. On October 1st, at San Marcial, the flow noted is 800 second-feet; on October 1st, at El Paso, is given as 1,400 second-feet.

Q. You are using 1897 or 1898?

A. 1897.

Judge BURCH. Will you state that to me again?

(Witness repeats.)

Q. What is the flow at El Paso on October 3rd?

A. At El Paso, on October 3rd, the flow is given as 460 second-feet.

Q. Allowing, then, that the water had taken three days to travel from San Marcial to El Paso, there was at El Paso from that water some 340 cubic feet less than the flow by San Marcial three days before?

A. Two days before—two days interval between the first and third.

Q. What was it on the 4th?

A. It was 350 on the 4th at El Paso.

Q. That was allowing three full days for it to flow, between the first and 4th, down to El Paso?

A. Yes, sir.

955 Q. That would make a loss, then, of what amount of water between San Marcial and El Paso between those dates?

A. About 450 second-feet.

Q. Now compare the flow at San Marcial on October 2nd with the flow at El Paso on October 6th, and what loss does it show, allowing three full days?

A. The loss indicated there would be about 500 second-feet.

Q. Take the flow at El Paso; what was the total amount of flow at the two places?

A. The flow on the 2nd at San Marcial was 800 second-feet, and at El Paso on the 5th is noted as 300 second-feet.

Q. Take the flow at San Marcial on October 3rd; what did it amount to?

A. At San Marcial on October 3rd the flow was noted as 650 second-feet.

Q. Allow for time for it to get down to El Paso, and state the amount.

A. On the 6th at El Paso it was 280 second-feet.

Q. What loss was that?

A. The loss between—in the interval time between the 4th and the 7th, between San Marcial and El Paso, would be indicated—about 420 second-feet.

Q. Out of a total amount of water of how much?

A. Out of a total amount of water at San Marcial of 650 second-feet.

Q. What was the amount of flow at San Marcial on October 5th?

A. On October 5th at San Marcial it was 5,300 second-feet.

Q. Allow time for that to reach El Paso, and what amount was it?

A. On October 8th at El Paso it was only 480.

Q. Total loss how much?

A. The total loss is—the total difference between these two is 4,820; that is, with a three-day interval.

956 Q. Well, what would it be with four-day interval?

A. With four-day interval it would be 1,300 second-feet.

Q. That is you mean on the 9th?

A. Yes; from the 5th to the 9th.

Q. Now, what was the flow at San Marcial on the 6th?

A. At San Marcial on the 6th there was 9,100.

Q. What was it at El Paso three full days later?

A. That is on the 9th also?

A. Yes, sir.

A. It was 4,000 at El Paso.

Q. A loss of how much?

A. That is a difference—I don't say that these are losses. The difference is 5,100 second-feet.

Q. What was the flow at El Paso on the 10th?

A. At El Paso on the 10th it was 3,600 second-feet.

Q. If you allow for it taking four full days to get down instead of three there would have been a greater difference, would there not?

A. I don't understand your question.

Q. If four full days were allowed for that water to get down from San Marcial to El Paso, and there was 9,100 cubic feet at San Marcial on October 6th and only 3,600 cubic feet at El Paso on October 10th, then there would show a greater loss than if you compared the San Marcial flow of the 6th with the El Paso flow of the 9th, would there not?

A. Yes; there would.

Q. What was the flow at San Marcial on October 7th?

A. On the 7th at San Marcial the flow indicated is 5,700 second-feet.

Q. What is the flow at El Paso three days later?

A. On the 11th at El Paso is 3,400 second-feet.

Q. What is it on the 10th at El Paso?

A. On the 10th at El Paso it is 3,600 second-feet.

Q. As between the 9th at San Marcial and the——

A. I gave there the 7th at San Marcial——

Q. And the 10th at El Paso; what was the difference?

957 A. 2,100 second-feet.

Q. Which was less?

A. The El Paso flow was less.

Q. As between the 7th at San Marcial and the 11th at El Paso, what is the difference and which is less?

A. 2,300 second-feet, and El Paso is less.

Q. What was the flow at San Marcial on the 8th?

A. 3,900 second-feet.

Q. What was it at El Paso on the 11th?

A. 3,400 second-feet.

Q. A difference of how much?

A. 500 second-feet.

Q. What was the flow at San Marcial on October 9th?

A. On October 9th at San Marcial it was 4,500 second-feet.

Q. What was it at El Paso?

A. On the three-day interval it would be the 12th, and the flow was the same at El Paso.

Q. What was the flow at San Marcial on October 10th?

A. On October 10th at San Marcial it was 15,500.

Q. What was it at El Paso on October 13th?

A. On October 13th at El Paso it was 5,000.

Q. A loss at El Paso?

A. Yes; a difference there of 10,500.

Q. Now, allowing 1,000 cubic feet for the ditches between these two points, what would be the amount still unaccounted for?

A. With a difference of 10,500 second-feet, allowing a loss of 1,000 cubic feet for the ditches, there would be 9,500 second-feet unaccounted for.

Q. And comparing that flow at San Marcial with the flow at El Paso, October 14th instead of the 13th, what would be the difference?

A. 12,000 second-feet.

Q. What was the flow at San Marcial October 11th?

A. Is noted as 8,100 second-feet.

Q. What was it at El Paso for the corresponding time figured on here?

958 A. Three days difference.

Q. Three-day interval?

A. 3,500 second-feet.

Q. A difference of how much?

A. 4,600 second-feet.

Q. What was the flow at San Marcial October 12th?

A. San Marcial, October 12th, 6,100.

Q. El Paso, three days later?

A. At El Paso, on the 15th, it was 2,400.

Q. A difference of how much?

A. 2,700 second-feet.

Q. What was the flow at El Paso four days later?

A. 2,000 second-feet.

Q. A difference of how much?

- A. A difference of 4,100 second-feet.
- Q. What was the flow at San Marcial October 13th?
- A. October 13th the flow at San Marcial was 5,100 second-feet.
- Q. What was it at El Paso three days later?
- A. 2,000 second-feet.
- Q. What was the difference?
- A. The difference is 3,100 cubic feet.
- Q. What was it at El Paso four days later?
- A. 1,600 second-feet.
- Q. What is that difference?
- A. 3,500 second-feet.
- Q. What was the flow at San Marcial October 14th?
- A. At San Marcial, October 14th, was 4,700 second-feet.
- Q. What was it at El Paso three days later?
- A. That is, on the 14th at San Marcial?
- Q. Yes, sir; the 14th.
- A. Three days later, on the 17th, at El Paso the flow was 1,600.
- Q. What was the difference?
- A. 3,100.
- Q. What was it at El Paso four days later?
- A. 1,700.
- Q. What was the difference?
- A. 3,000 second-feet.
- Q. What was it at San Marcial October 15th?
- A. San Marcial, October 15th, it was 4,300 second-feet.
- 959 Q. What was it three days later at El Paso?
- A. On the 18th, at El Paso, it was 1,700 second-feet.
- Q. What was the difference?
- A. 2,600 second-feet.
- Q. What was it at El Paso four days later?
- A. It was, at El Paso, four days later, 1,600 second-feet.
- Q. What was the difference?
- A. 2,700 second-feet.
- Q. What was it at San Marcial October 16th?
- A. October 16th, at San Marcial, it was 3,900 second-feet.
- Q. What was it at El Paso three days later?
- A. On the 19th, at El Paso, it was 1,600 second-feet.
- Q. What was the difference?
- A. 2,300 second-feet.
- Q. What was it at El Paso four days later?
- A. 1,500 second-feet.
- Q. What was the difference?
- A. 2,400 second-feet.
- Q. What was the flow at San Marcial October 17th?
- A. October 17th it was 3,500 second-feet.
- Q. What was it at El Paso?
- A. Three days later—
- Q. Will you now please run on down to the end of the month and show the comparative difference between the flow at San Marcial with El Paso, with each date three days later at El Paso and also four days later?

A. From the 17th?

Q. From the 17th.

A. On the 17th, the flow at San Marcial being 3,500, with a three-day interval there was: The El Paso was 2,000 feet less, and with a four-day interval it was 2,050 less. On the 18th the flow at El Paso was 3,500. Three days later—no; at San Marcial, on the 18th, the flow was 3,500; on the 21st, at El Paso, 1,450—making a difference of 2,050 second-feet. Four days later the flow at El Paso was 1,400, making a difference of 2,100 second-feet. On the 19th, at San Marcial, the flow was 3,400 second-feet. Three days later, at El Paso, it was 1,400 second-feet, showing a difference of 2,100 second-feet in a three-day interval. In a four-day interval at El Paso it was 1,320 second-
960 feet, making a difference of 2,080 second feet in the four-day interval.

On the 20th, at San Marcial, the flow was 4,300 second-feet. On the 23rd, at El Paso, it was 1,420, making a difference of 2,080; and on the 24th, at El Paso, it was 1,500, making a difference for the four-day interval of 2,800 second-feet.

On the 21st, at San Marcial, the flow was 4,700 second-feet. Three days later, at El Paso, it was 1,500 second-feet, making a difference of 3,200 second-feet. Four days later at El Paso, it was 1,460 feet, making a difference of 3,240 second-feet.

On the 22nd, at San Marcial, the flow was 5,100; three days later, at El Paso, the flow was 1,460, making a difference of 3,640. Four days later it was 1,400, making a difference of 3,700.

On the 23rd, at San Marcial, the flow was 4,700, and three days later, at El Paso, it was 1,400, making a difference of 3,100 on the three-day interval; and four days later it was 1,380 at El Paso, making a difference for the four-day interval of 3,120.

On the 24th, at San Marcial, the flow was 4,300. On the 27th, at El Paso, it was 1,380, making a difference of 2,920. On the 28th, at El Paso, it was 1,460, making a difference of 2,840.

On the 25th, at San Marcial, the flow was 4,300 second-feet. On the 28th, with the three-day interval at El Paso, it was 1,460, making a difference of 2,840 second-feet. With the four-day interval it was 1,410, making a difference of 2,890 second-feet.

On the 26th, at San Marcial, the flow was 4,300; on the 29th, at El Paso, it was 1,410, making a difference of 2,890; on the 30th, at El Paso, it was 1,400, making a difference of 2,900 second-feet.

On the 27th, at San Marcial, the flow was 4,300. On the 30th, at El Paso, the flow was 1,400, or a difference of 2,900 second-feet. On the 31st, at El Paso, with a four-day interval, the difference was 2,950 second-feet.

On the 28th of October, at San Marcial, the flow was 3,900 second-feet; on the 31st, at El Paso, it was 1,350, making a difference
961 of 2,550 second-feet. On November 1st it was 1,695 at El Paso, making a difference of 2,205 second-feet.

On the 29th, at San Marcial, the flow was 3,900 second-feet. On November 1st, at El Paso, it was 1,695 second-feet, making a difference of 2,205 second feet. On November 2nd, with a four-day interval—

Judge BURCH. How many of these months are you going through?

Mr. HAWKINS. I don't know; when we get through with this—

A. The difference was 2,375 second-feet.

On the 30th, at San Marcial, the flow was 4,300, and on the 2nd of November, at El Paso, it was 1,525, making a difference of 2,775 second-feet.

Judge BURCH. I understand from the witness's testimony that these are mere computations which anybody can make and is by way of argument. The evidence itself is in. We are taking up the time of the court by this witness making these computations here that may be made by anybody at any time. They have no more weight than if counsel or anybody else made the computations, figured them out himself, and then offered them to the court by way of argument. I offer this more by way of suggestion than by objection to the course pursued.

Mr. HAWKINS. Thank you for the suggestion. I have no desire to take up the time of the court, but these are very valuable calculations and very properly made by the witness. The net result of his calculations are put in evidence.

Judge BURCH. The multiplication table always acts alike if properly used. I don't object to this; I understand there is only one day more in this month. I don't object to it at all; I simply offer it by way of suggestion to save time.

Q. (By Mr. HAWKINS.) Did I understand that you took the measurements of the flow at El Paso during the month of May, 1897.

A. No; I did not. In 1897, the first of May, or very closely to that, the station was turned over by the United States Geological Survey to Mr. W. W. Follett, the consulting engineer of the boundary commission, and all the measurements from that time on have been made
962 by the boundary commission.

Q. What time was that?

A. Early in May, 1897; somewhere in the first of the month.

Mr. HAWKINS. Now we wish to get this result into the record for the convenience of the court. We will prepare, if you will agree, after submitting it to you, that we may prepare a tabulated statement showing these different days flow at San Marcial and El Paso and file it in the record.

Judge BURCH. Between San Marcial and El Paso?

Mr. HAWKINS. On the dates which have been testified to here and these other dates. I am willing to let anybody make it.

Judge BURCH. Anybody can do it. I am willing that this witness shall do it out of court to save time. That was the purport of my suggestion.

Mr. HAWKINS. If you agree then that the table may be prepared and incorporated into the record, we will desist from this course of examination.

Judge BURCH. That is the reason I made the suggestion.

The COURT. Is it within the power or incumbent upon either party to this cause to attempt to account for the water that is apparently lost?

Judge BURCH. We hope to account for a good portion of it very speedily.

Q. (By Mr. HAWKINS.) Up to May, 1897, then, you took these measurements, as between San Marcial and El Paso, or they were taken under your supervision and control, were they?

A. They were.

Q. And then you turned over the work at El Paso to Mr. Follett?

A. I did.

Q. Since that time you have no transcript of these measurements?

A. No, sir.

Q. Did you file, as an exhibit to your testimony the other day,
963 the data with reference to the flow of 1893 and 1895 at El Paso?

A. Yes; that was filed.

Q. In complete tables, the same as those you have before you?

A. At El Paso, in this form—

Judge BURCH. 1893 and 1895 at El Paso.

A. Oh, no. There is no record between 1892 and 1897 at El Paso.

Mr. FOLLETT. Except some few measurements at isolated times.

Q. (By Mr. HAWKINS.) From your observation and experience in taking the measurements of the river at both San Marcial and El Paso during the times when you were in charge of both stations, what was the difference between the times when the maximum flow of a flood would reach San Marcial and when it would reach El Paso?

A. To answer that question I can simply refer you to the figures or to those hydrographs which are on file. That is the best answer that I can make to that question.

Q. In making such hydrographs, they were made on the basis of there being three days difference, were they not?

A. No; not at all. The flow was plotted for each point for each day, and they show graphically the flow, and it can be taken from that.

Q. In making the comparisons between the floods reported by you and in that here you based the comparisons upon three days, did you not?

A. You mean—

Q. Not here now; I mean in your published report.

A. I did.

Mr. HAWKINS. That is all.

Cross-examination:

Judge BURCH. Mr. Harroun, we may want to recall you in a short time later on for further examination. You may retire just now.

Mr. HAWKINS. One minute. I would like to ask Mr. Harroun and have it noted: Do you know the general situation of Elephant Butte?

A. I have never been there, but I understand it to be about
964 forty miles south of San Marcial.

Q. You have noted the points on the maps where Elephant Butte is?

A. Yes, sir; I have.

And the above and foregoing was all the evidence introduced by the defendants.

REBUTTAL.

And now, in rebuttal, the plaintiff, the Government, calls as a witness—

W. W. FOLLETT, heretofore introduced as a witness, on being questioned by Judge M. C. Burch, said on direct examination:

Q. Did you hear the testimony of the witness McMahan when he testified?

A. I didn't hear that portion. I have just heard it read. I was out of the court room when he testified to that.

Q. Now, consider, do you know what or how many second-feet three or three and a half feet of water would carry at El Paso?

A. Size, now? I know approximately what it would carry.

Q. Take the conditions testified to by the witness there; a falling river during a continuation of eight days and three or three and a half feet of water on Christmas Day, how much in your opinion would the river, or by your computations, would the river be carrying in second-feet at

Christmas Day at three, and then put it at three and a half feet also?

965 A. It would be carrying somewhere between 500 second-feet and a 1,000; that is, 500 is the minimum for the three foot and 100 is the maximum for the three and a half feet?

Q. Then, between 500 and a thousand second-feet the river would be carrying?

A. Yes, sir.

Q. Now, suppose a man was starting on a falling stream at that stage and travelled twenty miles a day by the sinuosities of the stream for a period of twenty-one days—well, twenty days—and had rested two half days, making one day of rest—in other words, a total distance of substantially 400 miles from El Paso to Presidio del Norte—travelled at the rate of twenty miles a day and upon a current, as testified to by him, of about 48 miles a day, what would be the result in your judgment?

Judge FALL. Objected to for the reason that the question to be a hypothetical question, calling for the opinion of the witness as an expert, must be founded upon facts further than the evidence of the witness McMahan.

The COURT. His testimony was that it was falling a little when he left. On his final cross-examination, the last time he was on the stand he testified that it was about stationary or practically that.

Judge BURCH. Now, I will put it stationary.

Judge FALL. That is objected to for this reason, that it is not shown whether it remained stationary or whether it rose, and the court can of course understand the direction of this question, and we don't want the answer to get into the record, unless the facts are shown, and that is the reason we have called for a table of the water measurements at El Paso in 1893 and 1894. It is not shown that that water lasted for five days or sixty or seventy-five days after this man went down.

The COURT. I will let the witness answer the question.

(To which action of the court in overruling the said objection, the defendants, by their counsel, then and there excepted.)

966 A. As I understand the question, you want to know what would be the result of a river, if he left El Paso and travelled twenty miles a day down, and that with a current of 48 miles a day and a falling river?

Judge BURCH. Put it a falling river; that is, a general falling river.

A. Well, my opinion would be that the fall would travel faster than he did.

Q. Well—

A. That is, the party wouldn't travel as fast as the current—the current travelled faster than he did—that is not a hypothetical question.

Q. And to what extent—

A. Well, I wouldn't want to put that right down in miles. I should say it would be some faster than he did. How much faster, I can't say, probably five miles and perhaps ten miles a day.

Q. Well, suppose now he had had a stationary river—suppose it remained stationary—and he travelled that far?

A. Then it would remain stationary with him, except what was lost.

Q. Except what was lost?

A. Yes, sir.

Q. But suppose a very large amount of the river was lost; suppose he started out and the river at El Paso remained stationary, how much loss would it imply, if he ran aground when he got to Presidio del Norte, 400 miles down?

A. If it had been stationary it would imply a loss with what he had started with.

Q. And how many second-feet would that be, according to his statement of the height?

A. Somewhere between five hundred and a thousand feet.

Q. Then, if the river was stationary, and he run out on the dry ground, so that he couldn't get any further, when he got to Presidio del Norte, and the river remained stationary at El Paso, it would only imply a loss of from five hundred to a thousand second-feet, depending upon the exact stage when he left; that is, whether it was five hundred or a thousand feet?

A. Yes, sir.

967 Q. Another question. If he embarked and travelled on the river of that height, three to three and a half feet at El Paso, would the percentage of loss on a high river—that is, on a large volume, be as great as it would be on a low river at that season of the year?

A. Well, as a matter of opinion, I would say it wouldn't. The percentage wouldn't be as great. The actual loss would be greater, but the percentage of loss—I don't think it would be as large. I express that simply as a matter of opinion.

Q. Now, I want to call your attention to the cross sections of the stream that were in evidence, by a witness, Mr. Reed, the other day here, as having been made at the mouth of the river Concho. Did you hear the testimony of Mr. Reed in respect to this?

A. I did.

Q. Have you examined the cross sections which Mr. Reed made, and the figures which he made above the mouth of the Concho on the Rio Grande?

A. I have.

Q. Near Presidio del Norte?

A. I have.

Q. Will you mention the figure that he made there, as showing the number of square feet in the section?

A. He says the area of the cross section was 662 feet, and he states in his testimony that that was to the top of the bank.

Q. That is your recollection of his testimony?

A. Yes, sir.

Q. Have you examined the profile that he made there and put in evidence?

A. I have examined the cross section.

Q. Well, does it correspond with the figures?

A. It does not, exactly, with his figures.

Q. How widely different?

A. It scales 859 or 860 square feet.

Q. 859 or '60 square feet?

A. Yes, sir.

Q. And how much did he make it?

A. 662.

Q. Will you demonstrate to the court how that may be—take the map and show the court how that may be?

968 A. You mean how I obtained it by scale?

The COURT. Just explain the process. I know what the figures represent.

A. His scale here, the distance horizontally between each one of these vertical heavy lines, is 20 feet by scale, and his vertical scale between the fine lines is $4/10$ of a foot. Between the heavy lines is 2 feet. That is four fine lines and then a heavy one, and there is two feet between the heavy lines. Now, starting first at the bank of the river on one side, and taking the first twenty feet, I estimate the average depth of that first twenty feet. Then I take the next twenty feet and I calculate the average depth, and the next twenty, and the next twenty, and so on across the river. Then I multiply each twenty feet by the average depth, which gives me the square feet.

Q. The large cross section has reference to the place where he claims to have measured below the Concho?

A. Where he testified that he measured below the Concho.

Q. Where he made the cross section below the Concho?

A. Yes, sir.

Q. Now, I will ask you to read, if you have them there, what his figures were as to the number of feet in the cross section below the Concho?

A. 19,956.7 are his figures for the total cross section.

Q. Now, I will ask you if there was not an island; if he didn't testify to an island being in the vicinity of the cross section, just above?

A. The cross section ran right across an island, but the height of flood water was higher than he attributed—

Q. Does the island show on the cross section?

A. Yes, sir; that is on the cross section.

Q. I would like to ask you if that would make any difference to the flow of the river at that particular point, and what difference, if any?

How many thousand feet or hundred feet—

969 Mr. HAWKINS. You mean less than Mr. Reed calculates?

Judge FALL. I object. It is absolutely impossible, unless he can qualify the witness; if he can testify from the cross section of the velocity of the current, where the velocity is not shown on the cross section.

Q. You heard the testimony in regard to the backing-up process of the river six or seven miles?

A. Yes, sir.

Judge FALL. That is objected to.

The COURT. Take your own course.

WITNESS. Did I understand you asked me what the carrying capacity of this large cross section was?

Q. Yes; I want to know, if you can state.

A. No; I can not.

Q. If you can state what the current, what the velocity of the current was?

A. No, sir; I can't state.

Q. Will you state what you can state in regard to it?

A. I think I understand what you want. I asked Mr. Reed yesterday or Saturday what portion of this cross section likely carried moving water during a flood, and how much of it might have been dead water—might have been just simply backwater—and he differentiated the cross section, going across it, stating the portion of his stations that would undoubtedly carry water.

The COURT. Mr. Reed went over station 0 to station 10 and explained the condition as to flow—

Judge BURCH. In regard to what would apparently be the case at high water—not as to the amount of water that would flow.

Judge FALL. We have no objections.

Judge BURCH. The court has intimated, I believe, that he wants this.

The WITNESS. I scaled this lower cross section comparatively first, clear over from station 0 to station 28 plus 67, end of it, and my scaling came out within less than one per cent of his computed cross section. So I just estimated that his cross section was correct, as

I did not make any very big effort to get any great accuracy in scaling. Then I divided it into portions; from station 0 to station 10 I put down on one side, from station 10 to 11 in another one, and station 11 to station 12 with the first; from station 12 to 14 plus 50, the bank of the river, in the second column, and then from station 18 to the end of the cross section in the second column. This divided the whole up into two parts, one part being that about which Mr. Reed testified that there was undoubtedly a current through, and the other part being that about which he testified that it might be backwater—dead water—during high water. And I found that the first part, the part that there was a current during high water, was 13,800 square feet, and the other part 6,510 square feet. The sum of the two came up to his 19,050 square feet.

Q. Now, then, what deduction did you draw from that, or what deduction do you draw from that?

A. That the whole cross section shown here, a little over two-thirds, would, according to his testimony, be actually passing water, while the other third, or a little less than a third, might be dead water.

Q. That is all upon that score. Now, I want to ask you if you heard the testimony of Mr. Harroun this morning, relative to the San Marcial station.

A. I did.

Q. Gauging station?

A. I did.

Q. Are you acquainted with that station—the locality and the conditions at that station?

A. Yes, sir; I have seen it on several occasions. Examined it once—

that is, on the bank—and looked at it, and other times I have seen it from the bridge as I passed over it.

Q. Will you state to the court what the conditions are, as seen by you and examined by you, at the point where that gauging station is?

A. The gauging station is at the railroad bridge.

Judge BURCH. I will state to the court what we desire to show. If it please your honor, we expect to show, both by this witness and
971 Mr. Harroun, not as impeaching, but as explaining, so that the full truth may be known in regard to the matter, that the conditions at the San Marcial gauging station are exceedingly unfavorable for correctness of measurement, and have been.

Judge FALL. We withdraw all objection.

A. Why, the river flows pretty near due south by the town of San Marcial through a big level valley, and then there is a big hill the river practically strikes against—swings around to the west—and just at the point of this hill is where the railroad bridge is, and I should say it was between half a mile and a mile. I really don't think it is much over half a mile from where the river strikes the hill to where it eddies under the bridge, and below the bridge it immediately swings back to the south again. That is the situation.

Q. Anything about eddies or pools?

A. No; I have seen the river when it was up at that point. It wasn't every time I have crossed there; the river has been practically dry.

Q. What have you stated about that—

A. It follows as a natural consequence of the topography there that there would be eddies where that cross current would strike the piers of that bridge.

Q. Will you state how it compares with the El Paso, the gauging station there?

A. At El Paso, for the present gauging station, it is a straight river. One bank is formed by the loose rock fill or riprap. It is a loose rock fill where the Santa Fe road is—slopes down pretty steep, and has never been known to change at that point. It is either loose rock or solid rock. The railroad sets right on what is practically rock, but just at that point it is widened out into the river a little bit—rock thrown out to the side. That is the east bank. The west bank is an alluvial deposit, and sometimes it overflows something like knee-deep. Doesn't overflow
972 very much—about a foot, possibly a foot and a half. It is covered with brush and timber. Now, the El Paso station, as at present maintained, we take a great many gauges, a great many meter readings of the river during large flood. During a large flood there is a reading taken, a measurement taken of the river every two days, sometimes every day, all the time when there is water flowing there. Average about twelve times a month—from ten times up.

Q. Now, what have you to say relative to these conditions for accuracy, in your opinion, in the measurements of the river at San Marcial, whether they are good or not. If so, state how good, if you know; if you have an opinion or judgment about it?

A. I haven't been there, of course, as I say. I have never seen the river at high water, but judging from the topography of the station and what I have seen—that is, from passing over the bridge, that where the

current strikes below so closely to the bridge—why, it produces eddies and cross currents in such a way that the actual cross section passing water would average less. The actual acres of water, owing to the bridge piers, would be considerable less. That, I understand, is my opinion.

Q. You have examined these hydrographs or photographs or whatever they call them, heard them read here this morning, and knew of them before, did you not, relative to the difference between the San Marcial station and that of El Paso, in October, 1897?

A. I knew there was a big difference existing there during that month, much larger than I knew of at any other time—at least, that my attention has ever been called to, and I noticed that from the profiles. I could see from the looks of the profiles.

Q. I would like to inquire of you if the general estimate made by counsel of a thousand feet in the ditches between there and here is in your opinion all right?

A. I think so.

Q. That is by Mr. Hawkins, in his assumption that a thousand feet would be all right?

A. Yes, sir.

Q. Now, taking your knowledge of the bed of the stream, its contingency to lose water by seepage or absorption, or whatever it may 973 be termed, and all that, upon what ground or what hypothesis can that loss be accounted for, if any? In other words, what is your view about that apparent loss of water between there? What is your opinion about it? Wherein does it arise?

A. Why, the river had been very low for a couple of months and everything had gotten very much dried out, and I would account for a difference partly by the overestimate of the San Marcial station and partly by low—through the filling up of this dry ground along the banks of the river immediately after a long period of drought.

Q. Now, with relation to the remainder of that loss of water, in your judgment, whether there is any theory to which it can be attributed to—I mean a considerable loss of water, such as your judgment would lead you to, and any incorrectness in the measurement of the San Marcial station in overmeasurement of the San Marcial station.

A. Well, there would be an overmeasurement of the San Marcial station, and what would undoubtedly go into this dry stretch of country in between where the river had been dry for a couple of months.

Q. In other words, peculiar conditions incident to the season of the year?

A. Yes, sir; and the peculiar conditions involved.

Q. Your judgment is that that data of El Paso station is correct?

A. Oh, yes; I feel that. I have got that station down now so that it is a very reliable station, because I keep a man right there to measure the river.

Judge BURN: That is all.

Cross-examination:

Judge FALL: Q. You are now, Mr. Follett, testifying as an expert witness, are you?

A. Well, I can't say as to that. I am not exactly clear on the expert and another kind of witness.

974 Q. You are now giving the class of testimony which was objected to by the counsel for the plaintiff on your prior examination, are you not?

A. Well, you can fight that out between yourselves. I am not prepared to say.

Q. You heard the statement of the counsel that they had pledged you that you should not be examined as an expert on these questions, did you not?

A. Yes, sir.

Q. They have since had a different understanding with you, have they?

A. I don't remember that there has been any understanding about the matter. Some of the questions that he has asked me were rather unexpected.

Q. Then, without further consideration, they have proceeded to examine you along on the lines that they refused the attorneys for the defense to examine you, upon the ground that they had pledged you that you should not be examined as an expert. Now, without consulting with you, or without talking the matter over with you, they have put you on as an expert, after first having pledged you—

A. As I say, one or two of these questions were a little surprise to me.

Judge BURCH. Well, if it is an evidence of bad faith on my part, I will withdraw and waive the question in regard to the theory of the disappearance of the river. I don't wish to have counsel feel that way.

Judge FALL. We object to having anything withdrawn.

WITNESS. I am perfectly willing to answer it. I don't feel that he has exercised any bad faith with me at all.

Q. (By Judge FALL.) Now, you have stated that you accounted for a part of the loss from San Marcial to El Paso, on the ground that it was a dry season—dried up?

A. Yes, sir.

Q. This was in November?

A. October.

Q. Do you not know that on the 5th day of September the discharge at San Marcial was shown to be 2,900 feet?

A. I don't know. I wouldn't say it wasn't or that it was.

975 Q. That on the 6th it was 3,425? Here is the table.

A. I told you how I got it. I judged simply of the record here of the El Paso station, which showed an average of 130 second-feet.

Q. Judge judges simply from the El Paso station, and not from the San Marcial station?

A. Because I know nothing about the San Marcial station, only from these records.

Q. Then your testimony that it was all dried up above El Paso was based on your El Paso records, and not on the San Marcial station?

A. Yes, sir.

Q. Then, if the facts show that it was a wet station at San Marcial, and that it was a dry station at El Paso, what would your judgment be as to the loss?

A. It has gone somewhere; into the ditches, or else the San Marcial station has been overestimated, and more or less by absorption. I

wouldn't attempt to differentiate and say how much at each place. Perhaps I should say a low river; perhaps that would have been more accurate, if I had said a low river rather than a dry river.

Q. Then if, on the 26th day of September, it is shown that at San Marcial there was 5,175 feet, and on the same date in October there was only 4,300 feet, why wouldn't this 5,175 feet have been the river a month before that?

A. Oh, yes.

Q. You just happened to start your record on the first of October, and when we now go back to September and show you that the river—

A. My statement should have been that it was a low river at El Paso. I should not have said a dry river. I should have said a low river.

Q. Would you call 800 feet a low river or a high river?

A. Low river.

Q. That was on the 5th day of October?

A. Where?

Q. At San Marcial?

A. I don't know.

Q. If now, on the same date, or three days after, it was shown that 800 feet of water was at San Marcial and 300 feet at El Paso—

976 A. It might have all gone into the ditches.

Q. None of it would have gone into the bed of the stream?

A. That I don't know.

Q. Then, as a matter of fact, you have no idea where this water went to?

A. It went somewhere. I merely expressed an opinion as to where it went.

Q. Now, isn't your opinion as to where this water went to just about as good as your opinion of the gauging station at San Marcial when you say you saw it there when there was any high water?

A. Both are opinion.

Q. One about or ought to be about as good as the other?

A. I am still of the opinion that considerable of that water disappeared, and I am still of the opinion that the San Marcial station is a poor one, and that the floods, especially the area, are apt to be over-estimated.

Q. We will see about that. What examination did you ever make of the station at San Marcial?

A. I stated on direct examination. I once sat on horseback and examined it and the surroundings when the river was practically dry.

Q. Has it such a measuring meter as was testified to here by Professor Carpenter, as used in Colorado?

A. You are getting the method of measurement and the actual station mixed up. I will try and straighten it out. They have got on one of the piers of the bridge up there—they have a board nailed up, and my recollection is with footmarks to show the height of the water above the bed of the stream, and twice a day a man goes down there and looks at that and reads the height on that scale, make it so many feet above the bed of the stream. That is the daily record, kept twice a day. That don't require any skill; only requires a man that can look at those figures. Not at a certain intervals of time, which Mr. Harroun testified

to; he goes there with a current meter, such as Professor Carpinter used, and he measures and takes a line with a weight on it and sounds the depth of the water all across the river. Walked across on the
 977 bridge and sounds the depth of the water, and he has a measured distance along the side of the bridge, and then he drops this current meter and ascertains the velocity of the current, and by that he computes the amount as flowing at that particular time that he is there, and he also reads the height of this gauge.

Q. I think I understand pretty well now. This high-water mark or measure is fixed, you say?

A. The scale is fixed.

Q. That is fixed to the pier?

A. Yes, sir.

Q. Now, then, if that is fixed, and you measure it to-day and you measure it to-morrow and you measure it for a year, taking the gauge on this station, and there is a mistake in the measurements, it would be measured proportionately as much for the whole year, wouldn't it?

A. Yes, sir.

Q. Then the same proportion of them there might be a mistake as to the height; the same proportion of decrease would be shown between that station and El Paso from one day to another, and there wouldn't be any mistake from day to another?

A. But there is another element that comes in there. I didn't state that there was any mistake as to the height. I stated—

Q. I thought you said that was fixed there to the pier?

A. I stated there was likely to be an overestimate of the flow.

Q. How would that be arrived at if you didn't take into consideration the height?

A. The estimate of the flow involves three things—the height, the cross section, and the velocity. Now, as to the cross section is where I think the trouble arises.

Q. What is the matter with that?

A. Because these piers setting in there at frequent intervals produce eddies.

Q. There are no piers under the bridge at El Paso?

A. I have no piers—a couple of cars on a cable there.

978 Q. Now, what is the course of the river above there?

A. It swings in against the Santa Fe track about half and three-quarters of a mile and flows straight.

Q. But doesn't it, like the water at San Marcial, shoot across the river?

A. I don't think it does.

Q. On which side is your current—is your channel at the El Paso gauging station?

A. About the center.

Q. I understand you to say on the east side?

A. The east slope is steep.

Q. And on which side does the river swing into the Santa Fe Railroad, on the east or west side?

A. Comes from the west.

Q. Does it flow or swing into the west or east?

A. To the east; it strikes the east bank.

Q. About how far above this gauging station?

A. About a mile.

Q. What is the consequence of a current over against the bank of a river, say east; does it not rebound?

A. It may and it may not.

Q. Does it not always rebound?

A. It doesn't in every case, because the channel is in the sand.

Q. Does it not either rebound or cut over invariably; isn't that one of the laws of running water?

A. In this case it doesn't rebound, because the sand is in the center.

Q. It may go out and come back again?

A. It may and it may not; I will not say.

Q. How long has this station been stationed at El Paso?

A. At its present position the first gauge was taken the 3rd day of May, 1897.

Q. Who took it?

A. I did.

Q. Who has taken it since?

A. J. M. Couchesne.

Q. Did he take the measurements of the flood of 1897?

979 A. In the flood of 1897 Mr. Couchesne took daily accurate measurements. I saw by my record that he took daily measurements, until the flood reached about—I am speaking from memory—I think it was 12,000 second-feet, and then the water got so high that it would swamp the little car that he went across in on his cable, and he didn't care to go across any more, and he didn't get another ride in his car until the river fell again to about 10,000 second-feet.

Q. How was it that you got this reading of over 12,000 at that time?

A. It was by computing the acre-feet of the flow on up to the highest gauge reading.

Q. That was about 12,000?

A. That is, you mean—

Q. What was the highest point then at which you took this 12,000 by actual measurement?

A. On the gauge; I don't remember.

Q. And then you calculated over the 12,000 by reading over the gauge, and guessing at it?

A. It is more than a guess; it is perfectly legitimate.

Q. How accurate is it?

A. Within ten per cent anyway.

Q. Then why did you use a measuring system at all for?

A. You have got to have these measurements to start your guessing with.

Q. Then you don't need them at all; if you have six inches of water to start with, you can guess the balance?

A. Oh, no, you can't.

Q. You can go ahead and estimate—

A. You can for a short distance all right. When you get beyond that, you are getting into the realm of guessing too much.

Q. How far did you go up *to go* before you started with your guessing?

A. We went up to 17,000.

Q. And that was not in the realm of guesswork?

980 A. I think that was within twelve per cent. I think the maximum over was within ten per cent of the correct flow.

Q. What reason have you to think that?

A. Well, the continuity of the current, as you may call it, showing the uniform rate of increase.

Q. What do you mean by the uniformity of the increase?

A. The uniform rate of increase as it went up on the gauge, and what our measurements showed.

Q. If you did not measure after you measured 12,000 feet at the station, how did you know whether it was uniform or not above that?

A. Have every reason to believe it.

Q. What reason do you have to believe it?

A. The conditions continued the same.

Q. How do you know?

A. The visible conditions.

Q. How did they continue the same? Explain it.

A. The rise of the river kept on about the same rate as it had before.

Q. How do you know?

A. The rise, as I said, and that we measured; that didn't prevent a man from measuring the rise.

Q. Then you did measure the rise?

A. Measured the height, but didn't make a measurement of the water passing.

Q. How was it that this ear wasn't placed higher for unusual floods?

A. Why, we didn't have the accurate high-water mark there; the party that had given it didn't give it high enough.

Q. Didn't have an accurate high-water mark there; did you have anything else that was very accurate there?

A. In what way; what do you mean?

Q. In the same way as your high-water mark.

A. Well, I don't know how to answer that. I don't understand.

What do you mean?

981 Q. You said you didn't have a high-water mark; I ask you if any of the balance of the machinery that you used for measuring the water was as accurate.

A. The high-water mark didn't cut the slightest figure whatever in the measurement of the amount of water that passed there.

Q. It did not?

A. Not in the slightest.

Q. The previous high-water mark cut no figure on the record; I mean your gauge?

A. That gauge, just simply as—I told you how high it was. I went out on the pier with Mr. Couchesne; he had it built there; we need it at the beginning, and I says we will estimate the top of the water at 15 feet. Now, that says 15 feet above the river; it was 15 feet above or below anything else. That was a starting point on the gauge—it was 15 feet. Now we will measure down with a pole each day, twice a day, with a carefully graduated pole, from the top of this to the surface of the water, then subtracting that measurement from 15 feet, it will give us what we want—the height of the river on the gauge. As a matter of

interest, I will say that it so turned out that the water reached $4\frac{1}{10}$ feet on that gauge when it was dry— $4\frac{5}{10}$ feet when it was dry. The surface of the water reads $4\frac{5}{10}$ feet on the river when it is dry.

Q. How far from this particular point was it that you used your meter?

A. About 150 feet.

Q. In what direction?

A. Down the river.

Q. Below this particular point?

A. Yes, sir.

Q. Now, will you be kind enough to state how far above the Santa Fe Bridge at San Marcial is it to this point that the river makes that swing in there that you talked about and strike the bank?

A. I think it is about half a mile—about half a mile, perhaps a little more.

Q. Almost as far above that bridge as this point that you testified to in the river is in your gauging station?

982 A. It is about half as far and makes a larger angle of deflection.

Q. What is the angle of deflection? Do you know what the current of the river is—how it is deflected from this point at San Marcial?

A. I have never seen the river in flood.

Q. Do you know whether there is any in flood?

A. Why, it wouldn't get through—

Q. But then it wouldn't at El Paso; it wouldn't at San Marcial?

A. I didn't say that. Of course it has got to turn and go down the channel of the river. I thought you meant deflect and go to the other bank.

Q. You said it didn't deflect at El Paso?

A. I said it might go to the other bank and come back. But at my cross section it was at a straight river.

Q. And your cross section at San Marcial is where?

A. On the bridge.

Q. How do you know?

A. That's the gauge point of high water. The gauge is on the bridge.

Q. But the gauge that you measured by is on the pier, and you measured 150 feet from there?

A. There isn't any cable or car or any arrangements of that kind across the river at San Marcial.

Q. You know that from information?

A. I know that there is no car from actual observation, and that is all my information.

Q. When was it you were there?

A. In September, 1896.

Q. That was a year before this flood, nearly, at El Paso?

A. Before the flood of 1897; it was nearly a year before that. I have seen the station several times since, in crossing on the train, and I always, as a matter of interest, whenever I cross the river at any place, go out and look at it, and there is no indication of any car or anything of that sort.

983 Q. Now, you say it is not the height that you think affects the inaccuracy of the station at San Marcial, if it is affected at all, the height of the water on this gauge?

A. Oh, no; that is only a relative matter.

Q. It is only the velocity of the water?

A. Well, the velocity would vary, and the cross section, and, I think—

Q. Then you think possibly the particular point at which the cross section is taken there, together with the velocity, and that these two matters, in your opinion, are so arranged to make the measurements taken there very inaccurate?

Q. The cross section is the one that is the greatest element, in my opinion.

Q. Now, why is that?

A. Because the piers—of course, you put an obstruction into a stream and you create eddies around it. Now, these piers—there are three or four of them—and large bases of rip-rap around it, and, in my opinion, that would create eddies and cross currents to such an extent as to reduce the practical area of the cross section.

Q. Well, I don't know that I have—that I catch what you are driving at. I don't think it is exactly plain enough to me. What is the character of the fall of the river at San Marcial—that is, the river there where this gauging station is—what the river bed there?

A. There is on the south side—that is, it would be the east bank on account of this bend—there is some rock, I think, laying along for some distance. I know there is at the bridge because they have got some rip-rap—

Q. I don't mean the artificial—

A. It is very much the same as it is at El Paso. I don't think there is any rock bottom at all. I think it is a very shifting bottom.

Q. And there is no rock bottom at El Paso?

A. No, sir.

984 Q. Where this cañon comes, above your gauging station?

A. You mean the El Paso Cañon?

Q. Yes, sir.

A. Why, our station is above the narrowest part of it.

Q. Above the narrowest part of it?

A. Yes, sir; you might say it was in the cañon.

Q. Is that where you dug down there to find out something about a foundation for a dam?

A. Well, I didn't do any digging there, but this is about a mile—between half a mile and a mile—where there was soundings taken for the foundation of the dam.

Q. The engineers for the boundary commission dug these soundings there?

Mr. Ibarrola.

Q. He was a Mexican engineer?

A. He had charge of it.

Q. And he was with the boundary commission?

A. Yes, sir.

Q. And he was the man who made the soundings?

A. Yes, sir.

Q. And you say your gauging station is there in what is known as the cañon?

A. Above where the soundings were taken.

Q. And above the narrow part of the cañon, but not in the cañon?

A. Yes, sir.

Q. Is the current of the river there slower or swifter than it is at San Marcial?

A. I wouldn't attempt to answer that, because I have never seen the river at high water at San Marcial; I could give an opinion.

Q. You are giving your opinion as an expert?

A. My opinion is that the currents are about the same, but I am not sure of that.

Q. This, however, is in the cañon at El Paso, and the place where the gauging station is at San Marcial, where the railroad crosses,
985 is what is known as the Val Verde Valley, is it not?

A. There is a high bank on the south side—further side is beyond—

Q. In the valley there known as the Val Verde Valley?

A. The north side.

Q. Isn't both sides?

A. The south side is right up against the hill.

Q. Isn't there a high hill on the east side, before you cross the river, coming on over?

A. Yes, sir.

Q. And you say the banks of the river there are high?

A. No; I didn't say that.

Q. Now, what is the general topography of the country there near the bridge, where the bridge crosses?

A. On the west side of the river it is low ground; that, I should say, was subject to overflow.

Q. Well, what is on the other side?

A. On the south or east side—

Q. It is the south side of that particular point?

A. My recollection is that the hill comes right out close to the river; how close, I wouldn't attempt to say.

Q. Can you give any idea about how high that actually comes out—how high; that is, hill is from the bridge, or the south or east side?

A. I can't tell you whether it is right at the bridge.

Q. Do you not know that there is several acres of overflowed land right in there, plainly visible from the train passing there?

A. Between the bridge and this hill, on the south side, there may be a little land in there that overflows—perhaps the river strikes the hill a little above the bridge.

Q. Don't you know, as a matter of fact, that the hill is 200 yards at least above the bridge?

A. It may be that; but allow me to make an explanation. You have apparently made me testify that the gauging station at El Paso was
986 in the cañon. Now, while it is in what is known as the narrow or the pass, at the particular point that the gauge station is, the river is running right against the rock formation on the east side.

Q. It is not running down the channel, then?

A. Well, perhaps I am not quite precise enough in my language. The channel of the river, the east side of the channel of the river, is against a rock formation, along a rock formation. Just east of the east side of

the channel of the river is a rock ledge that comes out to the river, and on that rests the Santa Fe Railroad, and at the exact point where my gauging station is there was probably a little hole in the rock there and they threw more loose rock out, so that there is solid rock, as it shows, out to the river, but it is loose rock on the slope. Is that perfectly intelligent?

Q. Now, what did the Santa Fe Road throw that in there for?

A. To get it out of the way and to make a roadbed.

Q. And to keep the river from washing into their roadbed?

A. No, sir.

Q. But the bed of the river at that point is not rock bottom.

A. The bed of the river is not rock bottom and the west side is not rock bottom; it is alluvial deposit, as I testified on my direct examination, and it is probably alluvial for 600 feet. From the west bank of the river to the rock bluffs which form the east bank there is a little bottom in there about 600 feet wide that overflows in extreme high water. It is filled up with mesquite vegetation; well, vegetation I say, some of it mesquite and some other, and it doesn't carry any water, to speak of, via the station; carries some, but I have never taken it into account, because it is a small amount. It would be infinitesimal in comparison with the volume that would be going by in the channel of the river during flood.

Q. That is 600 feet, you say?

A. About.

Q. How high does the water get in it?

A. Foot and a foot and a half to two feet—maybe three feet in some points in the bed.

987 Q. A foot to three feet in 600 bed, and you take no account of that?

A. Because there is so much vegetation there; there would be a good deal of back water, just like Mr. Reed talked about. If you wanted to take the flooded cross section there it would show very much as his does, very little river water flowing during the flood season and most of it back water.

Q. How is the river below there as to being straight or crooked, for, say, a quarter of a mile below your station?

A. I think in about an eighth of a mile it takes a little swing to the west, and then swings back to the east, and goes through this narrow pass below my station.

Q. Now, on which side did you say this low ground is?

A. On the west.

Q. And the river takes a swing to the west below there?

A. Yes, sir.

Q. How does that backwater form—what forms the backwater?

A. Why, I didn't say there was any backwater.

Q. I thought you said this 300 feet by 600 feet of back water. Would prevent that?

A. I didn't say that.

Q. From running with just as much vegetation.

A. With vegetation growing in it, and maybe it is flooded—

Q. Foot and half or two feet or three feet of water, such vegetation

as you found would impede its flow. You said that as a matter of expert opinion?

A. Perhaps you can call it a little more——

Q. Never gauged that water, did you?

A. No; couldn't gauge it, because there was so much débris; couldn't get at any maximum amount.

Q. And in high water it flowed over this a foot and half up to three feet?

A. There may be a point right over ne't to the Southern
988 Pacific track where it may be three feet deep or knee-deep, but whatever would pass there would add to the amount of the record for what we have got for that station—would show a larger volume past El Paso than our records show.

Q. You didn't take that into account?

A. No, sir.

Q. What does your cross section comprise, or did it comprise during this flood of 1897?

A. The channel of the river.

Q. Well, wasn't this in the channel of the river?

A. Oh, no; outside of the channel of the river.

Q. You took the channel of the river only—didn't take the high-water mark where it was flooded above there?

A. Usually that was in the channel.

Q. This 600 feet there, with this flowing water over it——

A. Overflowed; I didn't state that it was flowing; it was overflowed.

Q. Be kind enough to give us an idea of your cross section, what your cross-section is, there. How high is that above the bed of the river?

A. Why, 8 to 10 feet.

Q. How high did the river get above its bed at that time?

A. I believe it was—it would be 10 feet on the gauge; that is ten feet above what it shows on low water. But the water soundings showed a greater depth.

Q. But I don't care anything about the soundings.

A. I want to make this plain.

Q. How high did the river rise above its bed, there, at that time?

A. It rose ten feet, I think.

Q. Was that your gauge; did you measure it up to ten feet?

A. No. Well, that was our gauge, yes.

Q. You measured it accurately up to ten feet, did you?

A. No.

Q. How high did you?

A. I can't remember what range it was when it was carrying
989 between 12,000 and 17,000. I would have to look at the books.

Q. Where are they?

A. They are over to the hotel.

And now, at this the hour of 12 o'clock noon, an adjournment of the hearing and trial of this cause is taken until the hour of 2 o'clock p. m. of this the 18th day of December, 1899.

And now, at this the hour of 2 o'clock p. m. of this the 18th day of December, 1899, the further trial and hearing of this cause is resumed. Present, as before.

W. W. FOLLETT (cross-examination resumed).

Judge FALL. Mr. Follett, have you now the data which you took during the flood of 1897 at El Paso?

A. I have.

Q. Will you be kind enough to state just how much, from this data—having refreshed your recollection, memory, as to how these measurements were taken.

A. Well, up to the 26th day of May, that was the big flood, we took off—for six days there was actual measurements of the river taken by soundings, and current meter measurements across the river.

Q. When did the flood commence?

A. And that river was high for some time prior to the first of May; the first of May it was carrying 5,000 second-feet.

Q. You say that up to the 26th day of May there were six days during which measurements were taken?

A. Between the first of May and the 26th there was 13th, but the six days immediately prior there was one taken every day.

Q. That was the 20th to the 26th, measurements taken every day?

A. Yes, sir; beginning with the 21st.

Q. Now where did your actual measurements, as carried on 990 there at that station, stop; at what stage of the high water?

A. The meter measurements stopped on the 26th. The gauge was then at 14.35.

Q. What does that mean?

A. That is just an arbitrary reading on the gauge.

Q. What does that mean? How high was that above the bed of the river?

A. It was practically ten feet above what the bed of the river is in low water. It may have scoured out three or four feet at that time. Would have to have had the soundings to show the actual amount above, the actual measurement on that day.

Q. You have had measurements taken since?

A. Yes, sir.

Q. Did it in fact scour out, the river, at that time?

A. I would have to have the actual measurements that were taken to answer that question. I am very certain that it was.

Q. From what are you certain?

A. Because it only scours on these high floods.

Q. Well, did you find that it had scoured out on any of your subsequent measurements?

A. It might have scoured out and filled up again.

Q. So it might scour out and be deeper on one day, and the next day fill up to its former level?

A. No; it would require longer than one day's time—take several days for it to scour out and several days for it to fill up.

Q. When you examined this gauge point, on the subsidence of the flood, what was the condition—the actual depth at that point?

A. I haven't the data here to answer that question.

Q. Was there any difference?

A. I haven't the data here to answer that question.

Q. Did you not state that your arbitrary reading would show 4 and some per cent of water in the river when the river was dry?

A. From $4\frac{5}{16}$ down to $4\frac{1}{16}$ is the arbitrary reading on the gauge
991 when the river is actually dry.

Q. Is that the arbitrary reading now?

A. It is $4\frac{1}{16}$; had been for three months.

Q. What was the arbitrary reading before this flood?

A. I don't know, because we didn't have the gauge established before this flood. The gauge was established during this flood.

Q. Was your gauge station moved during this flood?

A. Moved just at the beginning of it.

Q. Moved on what day?

A. I think we tore it down, and took the cable out of the river, from across the river and the ear, about the 27th or 28th of April, and the river was rising at that time; had been gradually going up. Then we took and moved it from the pump house at the smelter up to its present location, and got it stretched across the river, and got in such condition that we began to take the measurements on the 4th day of May.

Q. How high was the river at that time?

A. 11.4 on the gauge. That would be about 7 feet above what is the bed of the river in low water.

Q. Then your arbitrary reading at that time was about 4.10?

A. 11.4.

Q. But your arbitrary measurement—that is, what would your gauge have showed at low water at that time at that place?

A. 4.4, as it does now; that is, the river would have filled up.

Q. Then practically it was the same before the flood and after the flood, and your only knowledge as to whether it scoured or not is simply your opinion that it might have done so, when in reality the facts show that it was practically the same?

A. No; I don't admit that. I have testified, or tried to make it plain, that I didn't know what it was before the flood, because the river was away up.

Q. What did you estimate it at the time you made this measure-
992 ment on the 4th of May.

A. Didn't estimate it; measured it.

Q. What was the depth of it?

A. I don't recollect. I haven't those figures here.

Q. Your arbitrary measurement at that time, or your arbitrary gauge, would have been 4.10 at that time if the river had been dry?

A. No, no; hold on; I don't say that. I say that my arbitrary measurement made the surface of the water on the 4th day of May 11.4 on the arbitrary gauge.

Q. What was the actual depth?

A. I measured it, but I haven't got the data here to testify from.

Q. If you don't know the depth of the river—

A. I did when I took the measurement.

Q. What was it?

A. I don't know, for I haven't got the record or the book with it in here.

Q. If you knew the actual depth, or did you take an arbitrary measurement?

A. I have tried to explain. That is the way the record of the river is kept, is to keep a record of the elevation of the surface twice a day; that much is read twice a day, but the record is kept on an arbitrary gauge, and that is what the record was kept for, and it didn't make any difference whether that river was 10 feet deep or 50 feet.

Q. You keep no records of your depth?

A. Why, certainly, I kept a record, but I haven't them here. There is a whole stack of books, three times as big as that [indicating a stack of books in the court room], with records of measurements we have made at that station. Perhaps I can help you out a little on this. I think I know what you are trying to get at. I have got one of the books with the biggest measurement, which was taken on the 26th; I brought this book along just as an example, and perhaps that question might be asked.

Q. Well, take that date then.

A. Now, on that day, to show that question of scouring, on the 26th, the gauge read at the time the record was taken 14.35; now that was just practically ten feet above what is the bottom of the river—

Q. How do you know, if you—

A. Will you please wait until I get through?

Q. I want you to explain just what that was at that time. If you don't know what the depth was at the time, how do you—that in fact it was really ten feet when your arbitrary measurement showed 14.35?

A. If you will excuse me a moment, I started to say when you interrupted me—

Q. I am compelled to interrupt when you get to a certain point and we want information; we want it then.

A. There was 14.35 above what is the depth of the river when the river is dry. Now, we found the exact actual depth from soundings that the river was 15 feet deep—the water 15 feet deep.

Q. I thought you didn't have any of those measurements?

A. All along I have tried to explain that I didn't have the measurements on the first day, but I did have them on some other day.

The COURT. I think I will have to take a hand in this myself. The witness has stated, as I understand him, that he has a single one of those books in which his record of the measurements is kept, and only one, and he is now testifying from one of these books.

WITNESS. Only one; that happens to contain the largest measurement we ever got there, which was on the 26th day of May, and I have got there quite a number of other measurements, but none of them has the first measurement.

The COURT. Now go along and try—

Judge FALL. In justice to myself I want to state to the court that I haven't any intention of doing anything with this witness except to try to get some particular facts, and I think my questions have been directed to this, and perfectly properly. I have asked him twenty questions to try to get what the actual measurement was on that day.

A. On the 26th day of May, 1897, with the gauge height at 14.35, the arbitrary reading on the gauge 14.35, the maximum depth of water found was 15 feet.

Q. At the same place?

A. Yes, sir; at the same place. Now, as a matter of fact, when the river goes dry we find that the water stops running at about 2 and $\frac{4}{10}$ feet on the gauge, which would be ten feet below what this read, and showed—it shows a scour of 5 feet. The bottom of the river had scoured out 5 feet that would fill up again when the river fell.

Q. You say that your arbitrary measurement showed 14.35?

A. That is the reading on the gauge—estimated height that I got.

Q. That your actual measurement showed 15 feet?

A. An actual depth of 15 feet.

Q. That was 15; that would be $\frac{6.5}{10.0}$ more than your arbitrary measurement showed?

A. Well, it would be $\frac{6.5}{10.0}$ below zero of the gauge.

Q. Well, that would be more than your arbitrary measurement showed?

A. The $\frac{6.5}{10.0}$ below zero of the gauge.

Q. That—

A. The arbitrary measurement simply showed the elevation on the gauge.

Q. Didn't you say that your arbitrary measurement showed 14.35; what was that?

A. It was simply an arbitrary measurement on that gauge.

Q. I understand that; and you said that that would actually show a depth of 10 feet?

A. In low water that it would show that the bed of the river was 4.35, which was from —10 feet below this 14.35.

Q. According to your arbitrary measurement, if the bed of the river at that time had been at its usual stage, your measurement of 14.35 would, in reality, show ten feet?

A. If the bed of the river had not scoured out—at its condition in low water.

995 Q. I thought you said that was a dry stream—that when the stream was absolutely dry that your system showed 4 $\frac{4}{10}$.

A. That is dry; low water is dry.

The COURT. When you say the Rio Grande is dry, no current passing?

A. No water passing.

Q. Do you call that low water?

A. Yes, sir; at low water is a dry stream at El Paso.

Q. What you have testified as to what you would think would be the percentage of loss in high water and in low water, to this effect, as I understand it—that with low water now, as I understand you; first, you say low water is a dry stream?

A. Yes, sir; low water is a dry stream.

Q. Then what do you mean when you say that the per cent of loss—that the amount of loss at high water would exceed the amount of loss at low water—or that the per cent of loss at high water wouldn't be as great as the per cent of loss at low water. You don't mean a dry stream then?

A. I mean a stage of river—a low stage of river—that is what I meant to imply. My testimony was lax in that respect. It was a low stage of the river.

Q. Upon what did you base your theory that the per cent of loss at high water is less than the per cent of loss at low water?

A. It is a theory; I don't know that to be a fact.

Q. Upon what did you base it?

A. Well, the wetted area—the area covered—wouldn't, perhaps, bear as large a percentage to the total cross section and the total amount of water passing as the area would in low water. That is one reason.

Q. Isn't it a fact that in any high water in the Rio Grande River, taken at any point along the river, that the cross section of high water would bear a great proportion of the total area covered than would the cross section at low water?

A. I don't think so.

Q. You are an engineer?

996 A. I know I am; at least I think I am.

Q. I ask that just as a matter of fact.

A. The river would be very wide, and also deep, and the current is very swift, and it is carrying a large volume of water.

Q. Well, the current would be swifter, as a matter of course; the velocity of the current would be greater in the channel, I presume, but the total velocity of the water embraced in that cross section wouldn't be greater, would it?

A. In the extreme high water it might not be, but you know the river could get pretty high in a good many places—it gets out of its banks—

Q. We will take the extreme high-water point of the flood of 1897. Did you mean to state that the total area, as shown by the cross section of the river, taken at any point which you may describe, in 1897—that is, for the cross section, and taken at that time, wouldn't bear a greater proportion to the total area covered than would the cross section at times when there was 800 cubic feet in the river?

A. I don't believe—I haven't figured it out. I don't think it would.

Q. Can you figure it out?

A. It is pretty difficult to do that. I can try. It is hard to state what the river would average in width at my gauging station. It would not be so wide. I can't figure out that there would be very much difference. I estimate as near as I could tell. When you figure it out there is very little difference. But that is only one reason why I thought it was so.

Q. Now, is there any other reason that you think it is so, from your examination?

A. Yes; I don't know as it is a good reason, but it is a reason that influences me in arriving at this opinion, and that is, that in the flood time the river spreads out over the land and makes a deposit of practically impervious clay—figures out to be as we find it afterwards,
997 and the next flood comes by and makes another deposit, and until that is distributed by cultivation it is very impervious, so hard sometimes like cement, that it would absorb as much of a flood coming on in another year, wouldn't absorb as much in proportion to the area covered as does the channel of the river.

Q. How much is that deposit?

A. Oh, I can't tell you that; it varies at different places.

Q. Well, if there is no cause of the disappearance of that deposit, except by the cultivation of the land, when *when* the land is not cultivated how high would this river be raised in five years?

A. I can't tell you.

Q. Do you still say, after this examination which you have made, what figuring you have done, that the amount of loss by seepage or any other cause, or all other causes combined, is less in high water than in low water?

A. The percentage?

Q. The percentage is less?

A. That is my opinion.

Q. You have changed your opinion so far as the cross section is concerned, and confine it simply to the deposit of silt made by the overflows?

A. That is one of the reasons; I don't think of any other reasons. It is a matter I have considered one way and another for several years, and come to that conclusion. I can not on the spur of the moment state all the reasons that lead me to think that.

Q. But you have changed your opinion as to one of your reasons?

A. The assumption I made on the spur of the moment didn't bear out my conclusion in that respect.

Q. Say that the river is 50 feet wide, that it has two feet of water, and that its velocity is $\frac{1}{6}$ —that is $1\frac{6}{10}$, what would be the velocity in that river if the water was 4 feet high?

A. I can't tell you.

998 Q. Isn't there a rule for that?

A. There is, but it includes conditions that you haven't given.

Q. The same river, with the same depth, 50 feet wide, with a depth at one instance of 2 feet and a velocity of 1 and $\frac{6}{10}$, and the same river, the same width of channel and a depth of 4 feet, what would the velocity be?

A. There is a rule which I can not apply without having it here.

Q. There is rule, then?

A. It is known as Kutter's formula; that is, Kutter's formula is directed to obtaining the flow of water in the channel.

Q. What is Kutter's formula?

A. I wouldn't pretend to repeat it, or any other man. It has got a whole lot of arbitrary quantities and one thing and another that no man attempts to remember always.

Q. It is Flinn's formula, too, isn't it?

A. Flinn made a lot of tables based on Kutter's formula.

Q. Isn't it a fact that Flinn simply computed other tables, and finally adopted Kutter's formula as the most correct?

A. I think he did; I think he so states in his work. Kutter's formula is considered the most accurate that we have.

Q. Do you mean to say that the rules laid down by Flinn as to the velocity of the stream is Kutter's formula?

A. I don't mean to say that; I say in his work he has a lot of tables composed of Kutter's formula.

Q. You don't know what the velocity of the stream would be with double the amount of water flowing in it and the banks and the channel being the same?

A. I won't say I don't know, but I can't tell here, because I have got to refer to the formula before I would attempt to state it. So would any other engineer, unless he had it right in his mind.

Q. Now, what did you base your opinion upon that if Mr. McMahan was traveling twenty miles a day, and the Rio Grande River was falling when he left a given point, slightly falling, he was traveling twenty miles and the current was travelling 48 miles a day, that the river would fall faster than he would travel?

A. It is a matter that I might say had been "soaped" into me that a fall doesn't travel as the current of the river, but it travels near the neighborhood of the current.

Q. Do you mean to say that the fall would travel 48 miles a day?

A. The river; I believe it would. The fall would not travel so fast—

Q. Do you mean to say that the fall would travel—

A. You see, the river is going in a wave. Where there is a rise, the slope of the wave is downstream; when there is a fall, the wave is upstream. That wave doesn't travel quite as fast as the current does. The center of the flood runs away from it, so that the crest of the wave doesn't travel as fast downstream as the current.

Q. Now, suppose Mr. McMahan had left the El Paso bridge, and had travelled 48 miles, and that when he left the river was falling at the rate of 1 inch in 24 hours in the river—the river was falling at the rate of one in. in 24 hours—that he travelled 48 miles with the current, what would be the rate the river was falling?

A. He would get ahead of that fall; it might be stationary and it might rise—

Q. Suppose he travelled 24 miles, but half as fast as the current?

A. Just somewhere in between there the crest of that rise, or rather the wave, would pass him; and if he travelled 24 miles a day, or twenty miles, as he states he did, in my opinion, the fall of the river would get ahead of him.

Q. Upon what do you base the fall of the river, in speaking of it; is it running away from the river, out of the channel?

A. No; it is—for instance, the river will rise ten days at El Paso—

Q. No; I am speaking now of the fall.

1000 A. And then it will be stationary a little while, and then begin to fall. Well, now, that fall, of course, at the same time that it is falling, say, at El Paso, it would still be rising somewhere below El Paso, because the rise had not reached there. There is a wave, in other words, going down.

Q. Then Mr. McMahan might have gone down on the rise of the water, because the fall was not as great as the velocity of the current.

A. He might if he travelled faster. I don't believe it was as little as half the velocity of the current.

Q. Well, then, the fall, in fact, would not have been as great in the river, if he stopped twenty miles below, while the current had gone 48 miles—the fall wouldn't have been as great as it would if he had remained at El Paso?

A. No, no; it might have been more. There might have been a little. In other words, he would be catching up with the stationary river.

Q. And that is also based upon the supposition that the fall continues?

A. Yes, sir.

Q. At the initial point?

A. Yes, sir.

Q. Then, travelling at the rate Mr. McMahan was, and going 400 miles, he should have been there on the high water, shouldn't he?

A. No; I didn't say that.

Q. At the time he got there?

A. No, no; I said the fall would not be as great. He still might have had a fall.

Q. Then, if the fall was only half an inch when he started, it would have been as great——

A. It would not have been much—half an inch when he landed. I don't think that is correct assumption.

Q. Then, say the fall, that was the same at every twenty miles——

A. Well, it is a cumulative matter. Say the fall is one inch per day, he has twenty days on the road, that would be twenty inches fall.

1001 Q. But you say, as he is travelling down, he is going on this incline wave——

A. To illustrate, I would say that there was an inch fall at El Paso in twenty-four hours; he travels twenty miles down the river, and the current is going forty-eight; there might have been an inch fall at the place where he stopped that day.

Q. But the next twenty miles?

A. There would be a fall for the 24 hours, which in the meantime had come from El Paso, which would have been an inch more. In other words, there is a fall, but not as rapid a fall. He would have had, say, an average of half an inch a day, or three-quarters, instead of having as large a fall as there was in El Paso.

Q. Upon what do you base the assumption of a fall in the river?

A. Simply the running of the water out from under him.

Q. How about the seepage?

A. Yes, sir.

Q. Does that help the fall of the river?

A. There would be some decrease on account of seepage.

Q. About what would the seepage be along the river?

A. All I know about that is from the records, and base my opinion upon that—these measurements that have been taken between El Paso, and they show about a foot and $\frac{6}{10}$, 1 and $\frac{6}{10}$ second-feet.

Q. From that to 2 and $\frac{8}{10}$?

A. That is a question—depends upon the area in computation.

Q. What would say as to February, '97, 4.38 at San Marcial, 1.94 at El Paso, showing a loss of 2.44?

A. That is the distance.

Q. 170 miles, I believe?

A. 165 is what I take it—I take it at that—and gives an average of $1\frac{6}{10}$ feet loss.

Judge BURCH. Per mile?

A. I beg pardon, 1.07.

Q. Along the axis?

A. Yes, sir.

1002 Q. That would be merely along the sinuosities of the river's course?

A. Yes, sir; the sinuosities is the longest; that is taken along the axis.

Q. Now, the 165 miles or 175 miles below El Paso, if Mr. McMahan left on about the same amount of water that was flowing down, you computed you say between five hundred and a thousand second-feet?

A. Yes, sir.

Q. Now, if he was going down on about that same body of water, then 194 feet of that had been lost if the river bed was about the same in the same distance in the seepage?

A. Yes, sir; in the 205 miles, as I scale, he would lose about 350 second-feet in that distance if that same condition continued.

Q. Now, you spoke a while ago of some soundings that were made by the commission below your gauge station, or at least they were made, as I believe you stated, by the Mexican engineer; you and the Mexican engineer, as I understand, are members of the commission?

A. I was not consulting engineer at that time. I was employed as an assistant.

Q. Those soundings in the river bed were made by the Mexican engineer?

A. Yes, sir.

Q. Were these soundings adopted by the Boundary Commission as correct and so reported?

A. They are already in evidence here.

Q. And reported by their respective Governments?

A. Yes, sir; they are in.

Q. What do those soundings show with reference to the character of the river bed there?

A. I have cross sections of them showing the different material as they went down.

Q. Please explain to the court.

A. It is in document No. 229. The yellow on this diagram 1003 shows sand.

Q. And that is [referring to the diagram, see last page of Senate Document No. 229], as I understand now, a vertical sounding?

A. It is five feet from one line to another.

Q. How far those borings made?

A. From taking a six-inch iron pipe, and it is driven or worked down into the gravel as far as they could, and then take a sand pump and pumped the sand out.

Q. Take sounding No. 1, and just explain to the court how much sand and other matter there is there.

A. Sounding No. 1, which was taken very close to the west bank, shows the sand down for 24 feet. Then about a foot of gravel, then sand down to 40 feet, and then about a foot of gravel for a foot, then sand to 48 feet, and then gravel to 52 feet. Then altering with sand and gravel to 57 feet. Then sand to 60 feet.

Q. Was there any rock there?

A. Didn't seem to have been in that cross-section.

Q. No clay?

A. Didn't seem to have been at all. Here is clay over here on this side, and the red is rock that they went into.

Q. Now, I will ask you if that diagram, the first cross section in which any clay whatever is shown in these soundings, the first sounding is not sounding No. 10?

A. Yes, sir; that is correct, No. 10.

Q. The first rock which was found in any of these soundings was No. 5?

A. I think 1, 2, 3, and 4 were taken above the cross section they finally determined upon, and gave them up, and then started on this cross section, as you will notice that sounding from 5 to 16—16 doesn't, but 5 to 15 shows rock in the bottom.

Q. Can you state from the diagram what distance sounding No. 2 was from sounding No. 1?

1004 A. No; I can't. I think it is shown on one of these maps, the location of this. [Referring to maps preceding diagram in Document No. 229.]

Q. What was the character of sounding No. 2?

A. Very much the same, only a much larger proportion of gravel.

Q. No clay or rock?

A. Don't seem to have been any clay or rock in that.

Q. The first sounding in which rock was found?

A. No. 5.

Q. Sounding No. 5 reached what depth?

A. 75 feet.

Q. Sounding No. 5?

A. 50 feet to the rock and 2 feet into the ridge.

Q. No. 6?

A. About 75 feet to the rock.

Q. How about clay?

A. There was no clay in it.

Q. What was sounding No. 8—the depth?

A. Depth of sounding No. 8, 87½ feet.

Q. And the general character of that sounding?

A. Sand and gravel and little rock, but after that sand there, that was a boulder—went through a boulder and then went through sand and gravel again. Between the two rocks was between ten feet.

Q. How far into that rock did they go? [Referring to sounding No. 8 at the bottom.]

A. Two feet into the bottom rock. The first rock they struck—as a matter of recollection, I will say that the first rock was evidently a drift rock. It was different from the rock shown on the sides of the cañon, while the bottom rock was the same class—the kind of limestone we have on both sides.

Q. Can you state where sounding No. 10 was taken?

A. Have no recollection of that.

Q. Can't then state from your recollection where every one of those soundings were taken with reference to the other?

A. No; I can not.

1005

Redirect examination:

Judge BURCH. From the measurements of the cross section submitted by Mr. Reed, and in evidence, the cross section above the mouth of the Concho, taking into account the distance which it was said the river backed water above that point; I believe the testimony was six or seven miles, something like that; what would have been the carry-

ing capacity in second-feet of the river up to the banks, as shown by such cross section per second-foot carrying capacity?

A. Why, it would have been, assuming that the 662 square feet which Mr. Reed states on there was correct—it will be 2,120 second-foot, and assuming that the scaled area, which I may, 859 was the correct one, the carrying capacity would have been 3,250 second-feet.

Q. 3,250 second-feet would just fill the banks?

A. Yes, sir.

Q. At that point?

A. Yes, sir.

Recross-examination :

Judge FALL. Upon what do you found your answer to this question?

A. It was stated that when the Concho was in flood the water was backed six or seven miles up the channel of the Rio Grande. Now, I took Mr. Reed's high-water mark above the bed of the river, at his cross-section plat, and scaled it from the map 18.8 feet. Then I estimated that distance between the bed of the river and the top of high water at the mouth of the Concho would be the same.

Q. Just estimated all that?

A. I estimated that. Then I divided that 18.8 feet by 7 miles, to get the fall per mile, supposing it would feather out at seven miles, which gave me, with his cross section, gave me the necessary depth data to compute the flow of the cross section and the wetted flow. That is given for what it is worth.

Q. You are simply assuming, and not taking into consideration 1006 the velocity of the stream at all?

A. Assuming there was; you mean of the Concho?

Q. Of the other stream.

A. I figured the velocity; I got a fall of 2.7 feet per mile.

Q. That was figuring on this backwater?

A. That is the only way I had to get at the fall. I had to have the fall in order to compute anything as to the fall. Now, with the addition that the Concho wasn't bringing enough water to back up any through that cross section. There might have been a little, but none to course through that cross section. And that that fall of 2.7 feet actually existed in that channel, this cross section that he shows is big enough to carry thirty-two hundred—whatever it was—second-feet.

Q. That is also with the assumption that this backwater was no part of the water of the Rio Grande, but was entirely water of the Concho backed up; in other words, if this Rio Grande was flowing bed full at that time the Concho came into it, and the two waters—the waters of the stream together—back up six or seven miles, what would be the difference?

A. That would give a little more fall per mile, because the water of the Rio Grande might have some current at seven miles—be raised up a little, and give a little more actual fall per mile than I have estimated.

Judge BURCH. The greater velocity the greater the carrying capacity?

A. A greater carrying capacity when the Concho was empty.

Q. Why should not the velocity there be as great as the velocity at the lower cross section?

A. Well, there is two elements in there; there is the fall of the stream, and the—what the engineers call the hydraulic mean radius, one of the quantities that you wanted me to tell about in Kutter's formula. It is the cross section in square feet divided by the length of the wetted surface. In fact, now, that cuts a very large figure in computing the velocity, as well as the fall, and that lower cross section would give a very much larger hydraulic mean radius than the upper one.

Q. Then you state, as a matter of fact, as I understand it, that if the Rio Grande were flowing full at this point, and the Concho flowed its waters with it, and forced the waters of the two streams back seven miles, that the fall in the Rio Grande would be more than you have calculated?

A. It would be a trifle, but very little, though.

Q. About how much more?

A. I can't tell that, because I would have to go—

Q. Can't you tell that, if you could tell what the fall would be if it was entirely from the Concho waters?

A. No; I haven't his measurements; the square feet in this cross section, too.

A. It would only be a small matter.

Q. Would it be anything?

A. It might be half an inch to the mile, or something like that. It would be just what would be slackening the current and the Rio Grande coming down into the lower; that is what it practically means.

Q. What is the fall of the river and velocity of the current where you made your cross section at Rio Grande City?

A. Our low-water fall there is practically six inches to the mile. The high-water fall is about nine inches to the mile.

Q. Now, the velocity?

A. The velocity varies at different heights. I can read it; it is all in evidence.

Q. The maximum and the minimum?

A. The minimum velocity from the low water to the rise, giving as I compute it, is 1.63 feet per second; the maximum at flood height is 4.8 feet per second.

Q. What is the distance that you have calculated at this first cross section of Reed's?

A. With the scaled area, which is correct, 63.8.

Q. Then at full flood in the Rio Grande, at the cross section made by Mr. Reed, according to your calculation, the velocity of the water is not so great as it is at flood at Rio Grande?

A. No; there you can see what a figure that hydraulic mean radius cuts. While down below my fall is only 9 inches or 10 inches to the mile—something like that—the hydraulic mean radius is so much larger that the velocity is a great deal more than it is up here. Where my fall is, as I have figured it, 2.7 feet per mile, the velocity is a good deal greater. That shows the great figure that that hydraulic mean radius cuts.

Q. In one instance, a fall of 9 inches, the velocity is something like four feet?

A. 4.8.

Q. And in the other, average fall of 2.7 feet, the velocity is something over 3?

A. Is 3.8; that is owing to the smaller cross section.

Judge FALL. That is all.

P. E. HARROUN, another witness heretofore introduced, called by the plaintiff in rebuttal, and being examined by Mr. Childers, said on direct examination—

Q. I will ask you to state under what conditions your gauge readings and measurements were taken at the San Marcial station; explain the conditions generally there.

A. The San Marcial station is—the gauge and the readings are taken from the Santa Fe Bridge across the Rio Grande. The gauge is an ordinary timber, which is fastened to one of the piers in the river. The meter readings, soundings, and meter readings were taken from the 1009 bridge, or immediately above, or between the two piers.

Q. How often did you take the soundings?

A. The soundings? They were taken at various intervals.

Q. About how often—how many a month?

A. Two or three a month.

Q. Did you hear Mr. Follett say how often they took them at El Paso?

A. I think I heard; every few days, I understand.

Q. Every two days, I think. He stated every two days. Now, assuming that they took readings, soundings, every two days at El Paso, and you took yours only with the frequency you have stated at San Marcial, what effect would that have upon the comparative accuracy of the measurements at the two stations?

A. Of course the more frequently that the soundings are taken the greater accuracy with which the flow can be computed; and if they were taken every other day at El Paso the flow would be figures—it would be a closer approximation to the truth than if they were taken one, two, or three times in the month at San Marcial.

Q. Why?

A. For the reason that changes might have occurred which couldn't be observed on the surface of the channel.

Q. Couldn't be observed without making the sounding?

A. Without making the actual soundings.

Q. How are the physical conditions at San Marcial as to its reliability for accuracy?

A. The condition at San Marcial are such that it is very hard to secure absolute—why, to secure accuracy in the readings at that point, for the reason that the channel may scour out in high water and silt appear in low water.

Q. And taking that condition in connection with the infrequency of your soundings as compared with those at El Paso, what have 1010 you to say?

A. Why, the El Paso having been taken more frequently than those at San Marcial, they should have greater weight in the absolute determination of the flow.

Q. Now, Mr. Harroun, what kind of year prior to that flood of 1897

do your records here in evidence show; what kind of stage of water was in the river prior to that flood of 1897, October, 1897?

A. I would have to refer to these hydrographs or the figures. In September, 1897, at San Marcial the river was high after the 5th of the month, with the exception of something like five days from the 20th to 24th, inclusive.

Q. How was it then?

A. Then it ran 520 cubic feet a second. During the first of September it was down and flowing only 5 second-feet.

Q. For what period in September?

A. That was the 1st and 2nd of the month.

Q. How was it on the 5th?

A. It ran 2,900 second-feet.

Q. The 6th?

A. 3,425.

Q. 7th?

A. 1,150.

Q. Go on and read.

A. 520, 270, 520, 580, 5,350, 6,050.

Q. What is that date?

A. 6,050 was on the 14th of September.

Q. Go ahead.

A. 5,425 on the 15th; on the 16th, 2,550, 1,500, 3,075, 800, 520; on the 21st to the 23rd, inclusive, 800; on the 24th, 3,250, 175, 4,825, 3,075, 2,025; 975 on the 30th of September.

Q. When did this rise take place—what was the date of the big flood in October, the heavy rise in October?

A. The date of high water in October was the 6th.

Q. What was that?

A. 9,100 second-feet.

Q. Now, just state generally, Mr. Harroun, what the general stage of the water was in 1898 all through the year. Don't read off the whole year. Look at those hydrographs and state generally what it is.

1011 Mr. HAWKINS. Here is the exact data all the way. [Referring to Document No. 229.]

Mr. CHILDERS. I understand that. We want a general summary of it in evidence.

A. The flow in 1898 was very much less than that of '97. From September 3rd, '98, there was no water whatever in the river until November 8th, with the exception of six days in September, when it runs just about 6 second-feet.

Q. During the whole year '98?

A. That was in '98.

Q. The whole of '98?

A. In 1898, from September 2nd, or 3rd rather, until November 7th, inclusive, there was no water, with the exception of six days from the 10th to the 15th of September.

Q. How was it at El Paso at that time?

A. I don't know; I have no record of El Paso at that time.

Q. Go ahead and answer the question.

A. I haven't a record; Mr. Follett has that.

Q. Haven't you got the El Paso here?

A. No, sir; Mr. Follett has the El Paso—has taken the El Paso.

Q. Here it is; look at that.

A. '98 is not here.

Q. Didn't have '98; Mr. Follett has the '98 record?

A. Yes; I have it. It is in my books.

Q. You needn't tell it, then; I will ask Mr. Follett to state it.

MR. FOLLETT. You mean from September 2nd to November 8th?

MR. HAWKINS. I submit you make a table.

MR. FOLLETT. I have the daily records there, and there is a summary by months. If that is what you want, that is already in evidence.

1012 Cross-examination:

MR. HAWKINS. Who established the station at San Marcial?

A. A. P. Davis.

Q. How long was it under your supervision?

A. From 1895 until the present time.

Q. Was it under your supervision and control from '95 on during all the times?

A. It was.

Q. Did you testify here on your direct examination, in order to qualify these measurements, that they were accurate, fairly accurate and correct, and fairly and accurately represented the flow of the water at such station in the times mentioned in your reports from 1895?

A. I think I did.

Q. You also testified, did you not, that the gauge and other appliances by which the measurements were taken were so fixed at this station that with an observer there reporting to you twice a day, which was the general rule, and your occasional visits to check up, as against his reports, that you could determine that they were correct, did you not?

A. What, the gauge heights reported to me?

Q. Determine the gauge heights reported to you, and that the reports were correct?

A. The gauge heights as reported to me and from my examination I have every reason to believe were correctly reported.

Q. And you stated that your observer took observations twice a day and reported to you, and that occasionally you dropped in on these stations and took data yourself from which you were able to check up your reports?

A. Yes, sir; I think I did.

Q. Now, you have stated on your examination that if the

1013 measurements were taken at El Paso every other day by Mr. Follett or the observer there, and they were taken less frequently at San Marcial, that the El Paso measurements would show a more accurate report; do you mean that the El Paso measurements would show it more accurately than the San Marcial reports?

A. I mean with reference to any one station, the more frequently the measurements were made the more accurate would be the results obtained. That applies not only to that station but to any other station.

Q. You don't mean to say, then, that the frequency with which the measurements were taken during the flood of 1897 at El Paso would

give a more accurate result of that flow at El Paso than your measurements give at San Marcial?

A. With reference to those points?

Q. Yes, sir.

A. Yes, sir; I do mean that. I mean, as I have just stated in answer to your previous question, that wherever at these two stations the more frequently the measurements are taken at these stations the more accurate is the data resulting from these measurements; the more accurate is the measurement taken from that.

Q. In the measurements taken on June 14th at San Marcial it would show just as accurately the water that passed San Marcial as a measurement on the same day at El Paso would show the water that passed on that day at that point, would it not?

A. Exactly.

Q. If you took a daily gauge in October at San Marcial in '97 and Mr. Follett took a daily gauge at El Paso in October, '97, the two measurements ought to show the correct result and the correct loss of water between San Marcial and El Paso by comparing them three or four days later, should they not? By comparing the flow at El Paso three or four days later with the flow at San Marcial three or four days earlier, should it not?

A. Any measurement taken at San Marcial on one day and a measurement taken at El Paso when the same flow should pass should
1014 show what the conditions were.

Q. With equal accuracy?

A. With equal accuracy, in my opinion.

Q. All you meant then, in answer to the question of counsel, was that if you took a thirty-day period and measured every day, that you ought to ascertain a more accurate result than if you measured every other day?

A. Yes, sir; certainly.

Redirect examination by Mr. CHILDERS:

If, after you took a measurement of the river with the meter, any scouring out should take place, you wouldn't have any means of knowing that until you took your next measurement, could you?

A. No; that could not be determined without an actual gauge; that is the reason I say that the more frequently the measurements are taken the more accurate or more closer you get at the truth.

Q. If you measured the river with the meter, and you went there and got the gauge reading for the purpose of getting the cross section of the stream, and to-morrow a scour takes place—the channel was scoured and that increase continued until you took the next one—your next reading wouldn't measure the scour?

A. I can only know the conditions at the actual time that I take the measurements.

Q. You get the actual amount of scour out when you take the meter readings. Do you get the actual amount of scour in the river?

A. When I take my meter readings I get the actual depth of the river at the time it is taken.

Q. And if there has been any scour at that time you get that too?

A. I get that too.

1015 Recross-examination :

Mr. HAWKINS. And if there are scours at San Marcial at times when they are unaccounted for, at other times than at actual meter measurements, the same thing is true at El Paso, is it not?

A. I can't state from my actual knowledge, because I have had nothing to do with the station where it is located at the present time.

Q. He couldn't ascertain the scours there, except at the time when he made his actual soundings, any more than you could at San Marcial, could he?

A. Except he could when he made his actual soundings.

Q. I say at other times?

A. No.

Mr. HAWKINS. That is all.

And the above and foregoing testimony was all the testimony offered by the plaintiff, the United States, in rebuttal, and thereupon the defendants called in

SURREBUTTAL.

W. M. REED, a witness heretofore introduced and examined by the defendants, and having been previously sworn, and now in surrebuttal, and on being examined by Mr. Hawkins, said on

Direct examination :

Q. Have you any statement to make with reference to the accuracy of the diagram as submitted here, or any correction to make with reference to the area of the cross section, as formerly stated by you—of that upper cross section of the Rio Grande? If so, please make it.

1016 A. The diagram as here platted is perfectly correct according to the notes and my field book. The cross section, in calculating, copying down from my calculation in the field book, I put a "6" instead of an "8," and instead of it being 662.25 it should be 862.25. The diagram here is correct.

Q. That is the upper cross section of the Rio Grande?

A. The Rio Grande above the Concho.

Judge BURCH. In other words, you made a mistake against us and in favor of the other side, if that might be so termed, of 200 feet?

A. I made a mistake in copying; it was in my book, just as I showed here, 862.25.

Q. Then, so Mr. Follett's computation was within two or three feet of this?

A. My computation is made from the notes and not from this [referring to cross section].

Mr. HAWKINS. You stated in your original examination that you were an engineer in the employ of the Pecos Irrigation and Improvement Company, the chief engineer of that company. Do you bear any relation of any kind as an engineer to the United States or any of its departments; if so, what?

A. I make observations upon the flow of the water and duty of water and matters pertaining to irrigation and investigation to the Department of Agriculture through Mr. Elwood Mead, expert in charge.

Q. How long have you been so engaged?

A. Began in the spring of 1899.

Mr. HAWKINS. That is all.

Cross-examination:

Judge BURCH. Is that a continuous employment?

A. I don't know.

1017 Q. Compensation continuing now?

A. No; because our work has practically closed for this year, and it was for this year, and I understand that I shall take it up next year.

Q. When did it close?

A. I don't know; I haven't positive knowledge that it is closed, because I have been away and haven't received any mail for some time.

Q. You are on a regular stipend or salary. Are you employed by the day or are you on a regular stipend or salary?

A. I get for the season's work a certain amount of money.

Q. During that time were you engaging in working up this case and procuring witnesses below for the defendants in this case?

A. Immediately after my report to Mr. Mead I left on work for the defendants.

Q. And your work was engaged in getting up witnesses and one thing and another of that kind?

A. Largely.

Q. And preparing and assisting them to prepare the case?

A. If you call it that.

Q. And while under a salary of the United States and under their employ you also engaged yourself for compensation to the defendants in working up their case, preparing witnesses, etc.?

A. It might be considered such. I wasn't supposed to give all my time to the Government.

Q. That is true enough; I admit that. There is another question I want to ask you. You went there and took a cross section below the mouth of the Concho and took one above the mouth of the Concho, and from the profiles or cross section which you made here you make it appear that the one above the mouth of the Concho on the Rio Grande is much smaller than the one below, did you not?

A. Yes, sir.

Q. Why did you not take a cross section above the mouth of the Concho on the Concho to show that?

1018 A. I started in to do it, but my time was limited, and after I had reached a distance of about 2,000 feet I saw that it went over a very large valley, a whole lot of country, and I asked the people who were working with me how far that run back. They said four or five miles and I concluded I didn't have time to reach that.

Q. Too wide?

A. I didn't have the time. I have a cross section as far as I ran. I didn't submit it here because it wasn't complete.

Redirect examination:

Mr. HAWKINS. Is your services, and the performance by you of the duties which you have testified to on behalf of this defendant, with the consent of the Department of Agriculture?

A. They at least are informed of it and have never entered any objection—that is, my immediate superior.

Q. Who is your immediate superior?

A. Elwood Mead.

Q. When did you see him and confer with him with reference to this matter?

A. I saw him on the 11th of this month.

Recross-examination:

Q. In other words, he didn't blame you after he found out—he didn't find fault with you for having done this from the fact that you had done it?

A. No; I wrote him at the time I started that I was going.

Q. Did you write him the business you was going on and the particulars of it?

A. As far as I knew, when I left, I did. I was moving on telegrams.

Q. Didn't give him the details; told him you were going on work for somebody else?

A. Perfectly proper, because I am employed and do work for 1619 other people.

That is all.

And now, at this the hour of 4.30 p. m. of this the 18th day of December, 1899, an adjournment of the hearing and trial of this case is taken to Tuesday the 19th of December, at 10 o'clock a. m.

And now on this the 19th day of December, 1899, pursuant to adjournment, and at the hour of 10 o'clock a. m., the further trial and hearing of this cause is resumed.

Present as before.

Judge BURCH. After adjournment last evening there was some question as to whether Follett's report, or Senate Document No. 229, was introduced in evidence. It has been used all along here on the trial of the case.

Mr. HAWKINS. We insist that it is not in evidence.

The COURT. You assume that the report was in evidence when Follett was on the stand first, as the court denied you the right to cross-examine the witness on the report on the ground that it was not a part of his direct examination.

The COURT (after discussion and argument). You may consider so much of Senate Document No. 229 in evidence as contains the report of W. W. Follett.

(To which action of the court the defendants then and there excepted.)

1020 And the above and foregoing was all of the evidence and testimony produced and offered on the trial of the cause as aforesaid.

And upon the argument of the case, in compliance with the statement of Judge Fall, the quotations from the report of Major Wm. Emory are made a part of the record, to wit:

"The Sierra Nevada, in latitude 33 deg. N., branches. One great division unites with the Coast Range, forming the elevated promontory

of Lower California, and presented, when figured on the map, the appearance of the letter Y (Tulare Valley resting in the fork of the latter). Other branches or spurs are thrown off in a southeast direction, crossing the Gila at the mouth and many miles above, and traversing the newly acquired territory in the meridian of Santa Cruz and Tucson.

"That range, as well as the Sierra Madre and the Rocky Mountains, about the parallel of 32 deg., lose their continuous character and assume the forms that are graphically described in the Western country as lost mountains—that is to say, mountains which have no apparent connection with each other. They preserve, however, their general direction, NW. and SE., showing the upheaving power which produced them was the same, but in diminished and irregular force. They rise abruptly from the plateau and disappear as suddenly, and, by winding around the bases of these mountains, it is possible to pass through the mountain system in this region, near the parallel of 32 deg., almost on the level of the plateau; so that if the sea were to rise 4,000 feet above its present level the navigator could cross the continent near the 32d parallel of latitude. He would be on soundings of uniform depth from the Gulf of California to the Pecos River. He would see to the north and to the south prominent peaks and sierras, and at times his passage would be narrow and intricate. At El Paso he would be within gunshot of both shores.

"I noticed this remarkable depression in the continent in an exploration made by me in 1846, and called it to the attention of Mr. Buchanan, then Secretary of State, and it was upon this information that he instructed our minister, then negotiating the treaty of Guadalupe Hidalgo, not to take a line north of the 32d parallel of latitude in the boundary between the United States and Mexico.

"Passing to the south of this parallel, in about that of 31 deg., we find the plateau rising rapidly to the table-lands of Mexico; the ranges above described are no longer traceable, and the plateau gives evidence of having been disturbed by tremendous plutonic forces, and the mountains assume a loftier and more rugged and diversified appearance. As I have said before, the Sierra Madre Range of mountains can not be traced distinctly with our present information.

"The Rocky Mountains, near the head waters of the Rio Bravo, throw off spurs, which add to the confusion and make it difficult to separate the ranges from that called in New Mexico the Sierra Madre.

"It may be a question whether the Rocky Mountain range is not divided by the Rio Bravo, and if so, that which I have designated as the Sierra Madre of New Mexico will, in that case, become a spur of the Rocky Mountains. The geological formations to which I shall presently refer seem to favor this hypothesis. If this hypothesis be true, the Sierra Madre of New Mexico and the Rocky Mountain system are the same, and are only divided by the Rio Bravo. But this is a question which does not affect the general topographical description of the country and may be disregarded here. What I have described refers more particularly to the country west of the Rio Bravo."

Judge BURCH. You understand the Rio Bravo to be the Rio Grande?

Judge FALL. That is the same thing, the Rio Bravo and the Rio Grande del Norte.

"The Rocky Mountain system, commencing in the north, beyond the source of the river and beyond the limits of the 49th degree of north latitude, is the distinguishing feature of the country east of that river until we reach the Great Plains lying between the base of those mountains and the valley of the Mississippi. The axis of maximum elevation preserves a general parallelism to the Sierra Nevada range. Its principal chain, after passing the 36th parallel of latitude, becomes less elevated, and finally terminates in the Organ Mountains, near El Paso, reappearing again to the south and east, and becoming at last merged in the great mountain masses in Mexico.

"Another branch of these mountains diverges about the head of the Pecos, and running south with unequal elevation, crosses the Rio Bravo between the 102d and 106th meridian of longitude, forming the great bend in that river, and producing one of the most remarkable features on the face of the globe—that of a river traversing at an oblique angle a chain of lofty mountains, and making through these, on a gigantic scale, what is called in Spanish America a cañon—that is, a river hemmed in by vertical walls."

In part 2, page 3, he says (he is speaking of the Rio Grande):

"The river valleys either expand into more or less extensive alluvial bases, or are completely hemmed in by steep mural faces, forming chasms along their course, to which the Spanish term of cañon is generally applied. Thus, in following out the course of valleys in this district, we have a series of basins connected by cañons, the relative extent of these distinct topographical features being dependent on the local character of the formation or the varied influence of previous denuding forces.

"The alluvial tracts partake to a great extent in the sterility of the plateaus with which they are connected, seldom showing evidence of fertility, and in a great measure destitute of timber growth.

"In the case of the Pecos River, which may be regarded as the main type of streams belonging to this table-land formation, we observe a contracted but constant body of water coursing through alluvial tracts, or clearing its way through rocky cañons.

1023 "In the former case, its tortuous course is marked out between deep banks of earth, so that its turbid waters are for the most part invisible till you come directly on its brink. The average width of the stream, during the most of the year, is about 50 feet, and 8 feet deep. Only limited portions of the adjoining valley are subject to that degree of overflow, such as constitutes what is commonly understood as bottom land. Owing to the steep and crumbling nature of the banks, travellers often experience no small difficulty in watering their animals. The water itself, though highly charged with reddish sediment, is not unpalatable.

"In its passage through cañons, this stream, like the Rio Grande, cleaves its way between steep walls of rock, its course during low water being occasionally set off by lines of sandy or pebbly beach and forming frequent rapids.

"All the small intermittent streams of this region are copiously bedded with rounded pebbles derived from the adjoining limestone formation."

On page 7, in the second part, he says:

"The river itself presents few features of attraction. Its turbid waters

sweep along during the flood season, in June and July, a swollen tide, spreading its enriching sediment through the various sloughs and lagoons that line its course, often cutting off all approach by land to the main channel. During low water, which includes the greater part of the year, the river contracts its dimensions, running in a very variable channel, over sandy shoals, interrupted by numerous islands and exposed sand bars. Occasionally, in very dry season, it ceases to run altogether and stands in stagnant pools.

"The portion of the river bottom at present under cultivation in connection with the El Paso settlements includes a large basin lying south of the El Paso Mountains. In this is comprised the large alluvial tract known as 'The Island,' which is 30 miles in length by 2 to 5 in breadth."

1024 On page 29 of the second part, Chapter II, in speaking of the geological formation, he says:

"The outside of this limestone is, as already stated, of a dark ash color, often rough, presenting the appearance that a violently boiling mud pool would after being upheaved and suddenly cooled. Its inside is often white or pale yellow and mealy, with a great tendency to disintegration, which causes a great many holes, fissures, and excavations of every shape and description. These give this limestone a peculiar appearance, and one that is remarked by every traveller.

"The small as also the larger valleys are mostly formed by the continued washing out of the dells and fissure. Thus formed by denudation throughout the whole country, with their borders cracked in every direction, they deserve only the name of deeply cut ravines (cañons). This cracked peculiarity may be ascribed to the combined influence of a high temperature to which this formation may have been at sometime exposed and a subsequent more or less gradual refrigeration. There is scarcely a doubt but that all these table-lands were also formed under the same, and at the same time exposed to volcanic action. If so, this limestone really deserves the name metamorphic, and its somewhat anomalous appearance would be accounted for.

"It is our opinion that the limestone of the region above referred to is not of the same character throughout. It is not uniform and appears under the most variable shapes. It may be seen, in various localities, alternating with strata that bear the most striking resemblance to magnesian limestone.

"The strata of this formation are generally arranged horizontally. Sometimes, however, local disturbances appear which placed them into synclinal or anticlinal positions. The lower strata, often being of less solidity than the upper and readily desintegrating under atmospheric agencies, are finally washed out into excavations by the action of water. These excavations occur commonly in the beds of ravines and also in the banks of the river as considerable caves. They are also to be seen near the top of the table-lands and hill ranges, lying as so many terraces, one above the other; the more solid layers, resisting the action of external agencies, project far beyond the softer.

"High table-lands, intersected with deep vertically walled valleys, characterize the face of the whole country. The walls of these valleys, or, more properly speaking, cañons, are variously cracked open, and presenting ravines of greater or less extent in all directions.

"Those valleys seem to have relation only to the lithologic character of the formation. They are, therefore, usually short, and do not terminate in gradually diminishing fissures like the heads of rivers and creeks, but suddenly end with a deep chasm under the vertical wall of rock. Deep holes are washed out under these masses of rock, where rain water collects and remains for a considerable time.

"Excavations similar to those here mentioned, and retaining water for some time, occur also in the usually dry beds of the tributaries of the Rio Bravo. This is in most cases the only water that can be procured throughout the arid region bordering the upper portion of the Cretaceous basin of the river. Whilst the running water in these dry beds can find its way only by a subterranean passage through the holes and fissures presented by this formation, pools and small ponds of 150 to 200 feet in length occur in the cavities formed in the solid masses of rock. The valleys of the rivers Bravo, San Pedro or Devil's River, and Pecos resemble each other in this respect."

Also, in Chapter III of the second part, where he gives the geological features of the El Paso from the mouth of the Pecos River:

"Having completed our general sketch of the external features of the country, as presented on the line of route in nearest connection with the United States and Mexican Boundary Survey, we now retrace our steps to detail more particularly the course of the Rio Grande, especially in its connection with the extensive cañons by which its course is marked 1026 above and below Presidiodel Norte. In these we gain insight into the geological structure of a large and interesting scope of country, also connected with scenery unsurpassed for singularity and grandeur.

"About 70 miles below El Paso the mountains on either side of the valley converge, and present a lofty barrier in the direct course of the Rio Grande.

"Through these the river makes its way by deeply cut chasms, exposing the geological formation and structure in the sectional faces presented by its precipitous walls.

"We also see in this connexion the lower limits of that extensive aqueous deposit, forming what may be termed the Great El Paso Basin, which, by subsequent drainage in the progressive deepening of the bed of the Rio Grande, has brought to view the various terraced elevations marked along the course of the present valley in table-land bluffs and extensive gravelly plateaus.

"In fact, in our progress down the river we shall have constant occasion to notice the connexion between these cañons, as marking the limits of upper basins of deposit. Thus the general course of the river represents a continuous series, in descending steps, of basins, more or less extensive, then a cañon, forming, as we may say, the spout of the basin, which again opens on a basin of lower level.

"This simple statement embodies the great principle of formation that characterizes all this district, and gives to its topography a significance at once clear and instructive.

"It is in these barriers, then, these mountain dams, that the character of the valley, as a whole, can be best studied, and the chasm by which the river pierces them furnish the true key to their geological development.

"That portion of the Rio Grande thus marked by cañons and basins, extending from the first obstruction 70 miles below El Paso to Presidio del Norte, did not come under my own personal examination.

"The river here follows a general southeast course, making its way through strata of disturbed carboniferous limestone, having usually a dip to the southwest. The river course thus cutting the strata unequally, we should naturally expect not so much of a continuous cañon as an unequal development of rock on either side, presenting, it may be, bold and abrupt faces on the one side, and comparatively low on its opposite, thus affording the means of following near the river banks, by crossing from one side of the stream to the other. This, indeed, seems to have been the course pursued by the surveying party, with their pack trains, who were thus enabled to keep up a connexion with the line of survey.

"We should also except, as another consequence of this irregularity of feature in the rock exposure, not such a marked contraction of the river bed and channel as we should be more apt to find in the case of horizontal strata of equal development; rapids would be less apt to form, and lines of beach would be more frequent. Further on, in encountering the exposures of igneous rocks, these features would vary, and here would be the points characterized by greater obstruction to the regular course of the river, and also rendering a passage along its banks more impracticable.

"Such are the general features, as well as they can be gathered from maps of the survey, and the geological features of the country through which the river here passes.

"Approaching Presidio del Norte (Judge Fall: The mouth of the Concho), the valley of the Rio Grande again opens upon a wide basin, closely resembling in all its external features that seen above, near El Paso. The table-land, however, attains a greater height above the river bottom, presenting steep bluffs, often 200 feet high. The river bottom is also more contracted, rarely attaining a mile in width, and frequently reduced by the adjoining table-land to a mere strip. The river spreads out, embracing in its course numerous islands of deposit, and forming frequent sloughs along its main banks, subject to regular overflows. It is to these several tracts, islands, and sloughs that cultivation is chiefly confined.

"On the Mexican side the Rio Grande receives the waters of the Rio Concho, flowing from the southwest, and draining a large extent of country in the State of Chihuahua. This is the only constant tributary to the Rio Grande yet met with in our course downward; its waters at the usual height are clear, flowing generally over a bed of limestone pebbles."

* * * * *

"The natural boundaries of this basin consist of irregular mountain ranges, composed principally of carboniferous limestone, similar to that seen above. As a general thing, the strata here appears less disturbed, but show not unfrequently a strong westerly dip."

On page 51, of the second part:

"This first cañon commences about twenty-five miles below the town of Presidio del Norte.

"The general course of the river for this distance bears south 70 deg. west (mag.), passing at several points rocky knolls of igneous character which abut on the river. On approaching the mountain range directly in front, it will be seen that the river, widening through the lower line of adjoining hills, suddenly contracts its channel, and thence tumbling over a series of foaming rapids, enters the mountain range.

"The rock exposure here is of a most remarkable character, and different from any heretofore met with. When the adjoining mountains, reaching a height of 1,000 to 1,500 feet, present a clear sectional face, we see a somewhat regular series, composed of lavas, vesicular or compact in texture, alternating with thick deposits, of an earth form, of volcanic breccia. (Specimen Rock, No. 59 to 62, inclusive.)

"The general arrangement of these formations show them to be variable in thickness, and disposed in regular strata one above the other.

"The dark-colored lavas form usually the upper capping, together with one or more intermediate seams. The intervening lighter-colored breccias are often of considerable thickness, showing in some places a development of 300 feet or more, while at other points it is reduced to a thick seam. The usual appearance of these breccias is that of an earthy stratified deposit, varying in color from a whitish brown to a dull green; its texture is more or less crumbling, being composed of a whitish paste, which contains, occasionally, minute pebbles of quartz rock."

* * * * *

On page 52, of part 2: "Owing to the crumbling nature of this underlying stratum, we find it variously washed and often fantastically shaped by the peculiarities connected with its various exposures; it thus frequently forms burrowing caverns and dark grottos, set off with misshapen pillars. Quite invariably we find its base occupied by a talus, derived from the overhanging rock, forming a rough slope strewn with irregular blocks; thus its connection with the underlying rock stratum. * * *"

On page 53, of the second part:

"At a point about seven miles from the entrance of the cañon, where the river is completely hemmed in on each side by the largest development of the mountain range, being unapproachable except in boats from above, there is a cut-off on the American side, leading by an open country over a gentle swell of ground reaching the river about five miles below. This cut-off passes directly at the base of the high mountains intervening between this route and the river, having an average breadth of half a mile. At the summit of this swell is a depressed valley, the drainage of which leads directly toward this mountain barrier in its course to the river.

"In the following the dry-stream bed thus marked out, we find it entering by a narrow portal about 15 feet in width below, thence cutting its way by a uniform cleft through the entire breadth of the mountains to reach the Rio Grande.

"It thus presents a miniature picture of the larger cañon made by the Rio Grande. Its flows shows a smoothly washed rock surface, in which basins frequently occur, bed'd by washed sand and pebbles, and receiving the limpid issue of a small trickling stream. In its general course toward the river it makes frequent zigzag angles, thus giving a new feature of scenery at every turn, and presenting altogether a most

varied combination of the grand, grotesque, and beautiful. Along its sides is plainly observed a high-water mark, with an average height of 15 feet above the rocky bed, indicative of the sudden floods, derived from copious rains, to which this chasm is subject. This fact serves to give a somewhat nervous interest to its exploration. The height of the perpendicular walls on each side, corresponding to the thickness of the mountain range, is from 300 to 800 feet. The chasm thus formed opens up gradually towards the summit, forming a broken yawning abyss, untouched by sunlight, and having its depth exaggerated by the comparative dimness that shrouds it below.

"Thus shelter' from the sun's scorching rays, and cooled by evaporation from its brimming basins of clear water, with its entrance fanned by a constant stream of cool air, this cañon forms a grateful retreat. Further toward the river the descent is made by several abrupt falls forming extensive basins below. These are filled with clear water and offer natural bathing places of a most attractive character. Its exit on the river presents the same general feature of chasm, the final débouchement being marked by a débris of rocks and pebbles which project into the main stream and form a difficult and dangerous rapid.

"About three miles from this latter point, and twelve from the head of the cañon, the main development of the mountain range forming the Sierra Rica is passed. The final exit is through a narrow rock portal, and presents the appearance of an immense gateway. The width of the river at this point is barely 80 feet. The adjoining mountain ridge on either side is so broken and rugged as to be impassable for animals.

"On passing this narrow outlet we come upon a more open but still broken country, consisting of basins of limited extent set off with the usual form of gravelly table-land. The course of the river is frequently obstructed by low, rocky ranges, forming cañons; again pouring out of these cañons into the more open basins, it becomes expanded and forms limited sand beaches, patches (page 54) of bottom land, and 1031 occasionally small islands. This character continues for ten or twelve miles, when we enter on a more extended basis, through which passes the Comanche trail leading from upper Texas into Mexico by the adjoining Mexican settlement of San Carlos."

* * * * *

"It would be barely possible (from page 57 of second part) in a time of high water, to conduct a boat safely through this stupendous chasm. A strong wooden boat which accomplished the entire distance from El Paso to this place in the service of the survey, being here cast adrift, was found in broken fragments along the river course below. There are rumors among the Mexicans living near here of the attempted passage of this cañon by some daring individuals, but no authentic record of a successful result."

Page 68, part 1:

"Between Laredo and Eagle Pass or Fort Duncan, a distance of 120 miles, measured by the sinuosities of the river, the river, its banks, and adjacent country retain very much the same character; the obstructions in the bed of the river become more rocky and the fall more precipitous. At one place, one called the Falls of Río Grande or the Isletas, the rapids are impassable, even in small boats, except in the summer months,

when the river is swollen by the tropical rains which fall on the mountains to the south and west. These falls, or more properly rapids, are forty miles below Eagle Pass; just above, the old Mexican trail crosses by which the army under General Wool invaded Texas in the war of independence, and is the same by which the column of United States troops under General Wool invaded Mexico to effect a junction with General Taylor in the war of 1846.

"Fort Duncan, five hundred miles from the Gulf, measured by the sinuosities of the river, is only 208 miles measured in a direct line.

* * *

On page 71 part 1:

1032

"The navigation of the river between Edinburg and Roma is not free from obstructions, but they are mostly of shifting sand bars, except the one formed by Island 13 on the boundary map, which may be improved by damming two of the three channels. * * *

"Other obstructions besides islands are caused by numerous reefs and spurs of rock. Just above Belleville there is a formidable obstruction of this kind, marked by the wreck of the steamer 'Exchange.' This obstruction is formed by two reefs running in from the opposite sides and over-reaching each other, thus leaving but a crooked channel, through which the river passes at the rate of five miles per hour. A similar obstacle occurs about fifteen miles below Eagle Pass.

"Other reefs occur running entirely across the river, and are disposed in steps, one above the other. In seasons of excessive dryness they are bare of water. Of such character are the obstructions noted in the field notes of Mr. Schott as the 'the snares,' 'the meshes,' 'the stone turtles,' and the 'devil's pen,' all situated between the Islitas and Eagle Pass.

"In most cases the rocks forming the obstructions are sedimentary rocks of the Upper Cretaceous age, lying horizontal strata; these would yield easily to pick. How far it would be prudent to resort to cutting away these natural dams as a mode of improving the navigation, which would necessarily lower the pools above, would be a subject of investigation for each locality. * * *

On page 88 of the first part:

"The Rio Bravo, accommodating itself to the geological formation of the country, makes, between the 100th and 104th meridian of longitude, two great bends nearly symmetrical, one to the south and the other to the north. The area included in the southern bend is one vast Cretaceous bed, upheaved by igneous protrusions, sometimes forming ranges of mountains, as the Limpia Range, and at others isolated peaks, like Gomez Peak and San Jacinto. To the east and north of the Leon Springs the limestone beds are in repose, and do not appear disturbed until we get to Las Moras.

1033 "It is, generally speaking, very destitute of water, and the excess of lime in long-continued droughts often destroys vegetation."

Judge FALL. On page 89, of the first part, I want to call your attention to this:

"The immediate neighborhood of the Presidio del Norte (the mouth of the Concho), situated in the southern bend above described, is very dry, owing, I think, in some measure, to the manner in which the mountains recede from the valley at that point. The summer we passed there

clouds discharging water and electricity copiously were almost daily seen following the ranges of mountains about ten miles to the south, while not a drop fell upon the Presidio for some weeks. Indeed, so great were the rains to the south that the Conchos was swollen, and about the 10th of August the whole valley of the Rio Bravo below its junction was inundated. This is said to occur annually."

* * * * *

"For a description of the valley of the river from the Presidio del Norte to the cañon, where the San Antonio and El Paso road first strikes it, I gave an extract from the official report of Assistant Von Hippel:

"From Presidio del Norte to Vado de Piedras, a distance of twenty-four miles, the valley of the Rio Bravo has a course from southeast to northwest, and is from three to four miles in width. It is a good grazing country, and the soil is of easy cultivation. This valley is enclosed by hills on the American side, and on the Mexican side by a large mountain range.

"Vado de Piedras is a Mexican military colony, containing some three hundred persons. Here are large cultivated fields, which are watered by acequias, and yield abundant crops of wheat and corn. The place takes its name from the rock ford of the river opposite the town, which is quite shallow at the ordinary stage of the water.

"Here the river takes a course nearly north, through a valley, 1034 varying in width from one-half to one and a half miles, till it comes to Pílares, forty-five miles from Vado de Piedras. Pílares was once a military colony, and, from abundant signs still visible, the smelting of silver ore was carried on extensively. It has long been deserted, and I could not learn from what mountains in the vicinity the ore was procured. The river continues the same general course through a valley, bounded by high ridges of mountains, for some eighteen miles, when it enters a large cañon six miles in length. On emerging from this it changes its course to northwest, through an open valley of eight miles in length, the bearing of which is north and south.

"It now passes between low hills for some eight miles, when it breaks through an immense mountain range, where its banks are of perpendicular rock, of from four to five hundred feet in height. In this cañon are many rapids, and one fall of some six feet, making navigation impossible, except at a very high stage of water.

"One mile above the cañon, on the American side, is a level plateau of rock, about one-half mile square, near the centre of which are two warm springs, their cavities having a funnel shape, and of great depth. The temperature of the water in them is about 180 deg. Fahrenheit. From these springs the river continues a northwest course, through a narrow valley, for twenty-four miles, to the cañon where the San Antonio road leaves it."

"From the cañon up to El Paso, a distance of eighty or ninety miles, the valley of the river will average from six to ten miles in width and is almost everywhere within the water level of the river capable of cultivation. On the American side, however, there is no settlement until within a few miles of San Elizario, a distance of sixty miles from the cañon." * * *

Now, in part two, the rainfall for the year 1851, page 247:

"The river during the summer of 1851 was nearly dry in several places in our immediate vicinity, a slight current only making its progress near Frontera, while its bed served as the best road thence to 1035 El Paso."

Now, in Part 2 of 12th Annual Geological Report, page 242, is the following:

"The water of the stream, except in the central and southern part of New Mexico, is heavily loaded with silt, and this is deposited to a certain extent in each of these valleys, forming broad alluvial plains. The channel of the river through these valleys is usually choked by sand bars, and in times of low water the stream divides into a number of minor channels, and apparently a large percentage of the water is lost in these great deposits of fine material."

In Part two, of Emory's report, page 31:

"The surface of this region is usually dry; it is, however, well watered when compared to the country adjacent.

"The road from San Antonio to Del Paso del Norte crosses in this belt (about 40 miles wide) six clear and bold running streams, of which Las Moras, Piedras Pintas, Zoquete, and San Felipe are the most characteristic. They are somewhat similar in general appearance, and in all probability have their origin on a more solid but in a greatly deeper situated stratum; for they pour forth at once their crystal waters either from deep funnel-shaped basins or from rocky clefts. Several of these springs indicate a higher temperature than the water in the stream below.

"The water of all these little streams, as also that of the Rio San Pedro or Devils River, is strongly impregnated with carbonate of lime. Every hanging within its touch, or in any way exposed to its action, becomes perfectly coated over by its calcareous deposits in a remarkably short time.

"In consequence of the permanence and abundance of running water in these tributaries of the Rio Bravo, their bottom land will in time be highly valued for agricultural purposes. It would be an easy matter to irrigate it, as the fall of water almost throughout is very considerable."

Part two, page 41:

1036 "Besides the small streams, very changeable in their supply of water, the following are remarkable for their constant flow:

"Escondido, near the head of which is situated the town of San Fernando, has its mouth about three miles below Eagle Pass.

"Las Cavezeras, heading in the immediate vicinity of the Escondido, with the little town of San Juan de Allende and Nava near its source, empties some thirty miles above the destroyed rancho Palafox.

"The Salado, carrying what may be considered here a large body of water, which is supplied by several large branches from near Santa Rosa (Sabine, Alamo, and others), commingles its waters with the Rio Bravo some eight miles below Guerrero and nearly opposite Redmond's rancho.

"Alamo, having its source in, and bringing its waters down from, a more southern portion of the Mexican Sierra, falls into the Rio Bravo near Mier.

"The San Juan, gathering its waters in still more southern portions of

the Sierras which form the highlands of the states of Coahuila and Nueva Leon, empties just below Camargo."

Part two, page 43:

"Here, within a distance of about 2½ miles, several water courses empty into the Rio Bravo and form by their deposits a large island which, as a result of this united action, was named 'Los Ajuntas'; besides the Alamo, already mentioned, these tributaries are the Sulphur Springs, the Saladito, and Arroyo Hondo."

Part two, page 55:

"Our further route, adjoining the river on the Mexican side, passes over high ground, based on limestone rock, and attaining a height of 800 feet or more above the river, the strata here dipping slightly to the west. We again reach the river bed at the mouth of San Carlos Creek, which, draining a considerable valley extending to the south some fifteen miles, affords a constant stream of clear water.

1037 "Just below this point commences the gigantic cañon of San Carlos, through which for ten miles the Rio Grande, pursuing a nearly due east course, makes its way."

Part one, page 62, speaking of Rio Grande City or Ringold Barracks:

"This military post consists of a few comfortless frame houses, situated half a mile below Rio Grande City. Opposite, and four miles from the Rio Bravo, is the town of Camargo of about one hundred inhabitants. It is situated on the San Juan River, the first unfailing tributary of the Rio Bravo from the Mexican side. It is one of a series of rivers which rise in the so-called Sierra Madre and go to supply the Rio Bravo in summer, the season of tropical rains, when that river most requires replenishing, as then the supply of water from the melting of the snows at its northern sources is nearly exhausted."

Part one, page 67:

"The Salado, like the San Juan, and the Alamo, which comes in at Mier, is a clear stream, having its rise in the Sierras of igneous and metamorphic rock to the west and forms a true oasis in the wilderness of rotten limestone which is found on either side of the lower Rio Bravo, and which causes the waters of most of its tributaries to be brackish and unwholesome.

"The falls of the Salado are seven miles above its junction with the Rio Bravo." * * *

Judge FALL. I want to call the court's attention to the picture of the Falls of Rio Salado, which he states is just below Guerrero. Again, he speaks on page 70 of the San Pedro or Devils River, and the "beautiful, limpid stream of Las Moras, Piedras Pintas, Socate, and San Felipe, which come into the Rio Bravo at right angles and at equal intervals."

On page 30 of the second part, speaking of the stream between the Pecos and Devils River:

"There is but one constantly running tributary of the Rio Bravo between the mouths of the Pecos and San Pedro, a distance of 40 miles.

The waters of this tributary, of a blue crystal-like transparency, 1038 boil out in a deep chasm from beneath a solid mass of limestone, and pour a rapid and full current into the river, but a few paces distant, through dark green shades of flowery and fragrant thickets that

line its bed. Its solitary beauty, amid the barrenness and unbroken silence of the surrounding wilderness, suggested a fairy creation, and suggested the name of "Fairy Spring" to this enchanting stream.

"Other ravines or 'rock creeks' afford at times a small stream of clear running water. In their rocky beds occur here and there a series of water holes and small ponds, either isolated or connected only by a trickling run of water. There are several creeks of this character, especially in the vicinity of the Pecos, among which may be mentioned Painted Gallery, Nine-tailed Cat, Oak Creek, and Fox Hole."

First part, page 91:

* * * "While occupied at the cañon, in the astronomical determination of that station, a deluge occurred which will long be remembered by those present.

"In the middle of the night of June 25 the sky was overcast and our labors at the observatory obstructed. We had all retired to bed, when I was awakened by a roaring noise, which I supposed to be wind. I called to Mr. Burns, who was in charge of my zenith telescope, take the usual precautions against high wind. He answered that it was not wind, but water; adding if we did not leave the camp pretty soon we should all be drowned. I had made the selection of my camp on a spot which I supposed secure from any possible inundation, but on stepping out of my blankets found myself knee-deep in water, which was rapidly rising. My first impulse was to seize the chronometer and note-books of the survey and make for a small eminence upon which the observatory was placed. Only two persons were near enough to assist me, Mr. Gardner and my cook, and neither of them could swim. As we advanced the water came up to the chin, and the soft ground under foot gave way. It was with the greatest difficulty we reached the hill with our precious load. The night was inky dark, but I caused fires to be built, when all hands immediately went to work, and by the time day broke we had secured nearly everything of value. The only public property 1039 lost was some belonging to the escort, composed of raw recruits, many of whom could not speak a word of English, and who, in the absence of their commanding officer, took to the hills and could not be brought down till daylight. A tremendous rain on the adjacent mountain had fallen during the early part of the night, and the accumulated waters, finding insufficient drainage, made for themselves a new channel, which unfortunately passed through our camp.

"Through that whole region traces of the same kind of deluges can be found, where for months and years not a particle of running water is ever seen. These traces receive the name of arroyos, and I think may be taken generally as evidences of the country subject to long droughts, only interrupted at long intervals by heavy falls of rain."

Part one, page 50:

"It sometimes happened that the irrigation is produced by natural causes—the overflows of the river. This is the case in the basin of the Presidio del Norte and on most of the country susceptible to tillage in the valley of the lower Rio Bravo. Crops depending upon this mode of irrigation are very uncertain, the overflow of the river being very unequal as to time and extent. In some portions, however, of the Rio Bravo there are two overflows. This is the case at the Presidio del Norte, below

the junction of the Conchos River. The first overflow occurs in June, from the melting of the snows near the head of the Rio Bravo, in latitude 36 deg. 37'. The second occurs in August, from the tropical rains which fall on the mountains near the sources of the Conchos, in latitude 26 deg. 28'.

"This occurs to a limited extent on the lower Rio Bravo, which is principally supplied in the summer months by its tributaries—the Salado, the San Juan, &c. These take their rise in the mountains to the south, within the regions of tropical rains. How far the lower Rio Bravo is supplied by the melting of the snows at the head of the river I am not prepared to say; but I am inclined to the opinion that before reaching the Tertiary region near the mouth of the river most of the waters 1040 from that source are expended either by evaporation or absorption. In the intermediate portion of the Rio Bravo, that lying between Valverde, north of which the river is kept running by the melting of the snows through the summer, and the Presidio del Norte, where the Conchos joins it and supplies it with water from the tropics, a great inconvenience is felt for water in years of unusual drought. I was informed on good authority that in the summer of 1851 a man drove a gang of mules along the bed of the river from the Presidio del Norte to El Paso. The bed was dry for nearly the whole distance, occasional pools of water standing in places where the river bed was formed of rock or clay impervious to water. It was always possible, however, to procure water in sufficient quantities for drinking or watering animals by digging in the river bed a few feet below the surface."

I, E. L. Medler, do hereby certify that the above and foregoing, consisting of 861 pages, contains a full, true, complete, and correct transcript of all the evidence taken on the trial of the case of the United States *vs.* Rio Grande Dam & Irrigation Company, as taken from my stenographic notes, and the same is a true and correct transcript of said stenographic notes.

(Signed)

E. L. MEDLER.

In the supreme court of the Territory of New Mexico, January term, 1900. (May 1st, 1900.)

1041	UNITED STATES OF AMERICA, APPELLANT,	} No. 879.
	<i>vs.</i>	
	RIO GRANDE DAM & IRRIGATION COMPANY ET ALS.,	
	appellees.	

I, the undersigned, judge of the district court of the third judicial district of the Territory of New Mexico, before whom the above entitled cause was tried, do hereby certify that the above and foregoing 861 pages comprises a transcript of all the evidence, including depositions, introduced before me upon the trial of said cause.

(Signed)

FRANK W. PARKER,

Judge of the Third Judicial District Court.

UNITED STATES OF AMERICA,

Territory of New Mexico, 3rd judicial district court.

I, James P. Mitchell, clerk of the United States district court of the third judicial district of the Territory of New Mexico, do hereby certify

that the foregoing forty-one pages contain a full, true, and correct copy and transcript of the whole of the record in cause numbered 1243, wherein the United States of America are plaintiff and the Rio Grande Dam and Irrigation Company et al. are defendants, as the same appears of record and on file in my office.

In testimony whereof I hereunto set my hand and affix the seal of said court at my office in Las Cruces, New Mexico, this 8th day of February, A. D. 1900.

[SEAL.]

(Signed) JAMES P. MITCHELL, *Clerk*.

1042 And afterwards, on to wit the first day of May, A. D. 1900, there was filed in the office of the clerk of the supreme court of the Territory of New Mexico an assignment of errors, which said assignment of errors is in words and figures as follows, to wit:

In the supreme court of the Territory of New Mexico, January term, A. D. 1900.

UNITED STATES OF AMERICA, APPELLANT,	} No. 879. Appeal from third judicial dis- trict court.
<i>vs.</i>	
THE RIO GRANDE DAM & IRRIGATION COM- pany et als., appellees.	}

Assignment of errors.

Now comes the above-named appellant and says that there is manifest error in the record, proceedings, and decree in the above-entitled cause, in this, to wit:

I.

The court erred in its 7th finding of fact to the effect that between San Marcial and El Paso, a distance of 300 miles measured by the sinu-
osities of the river, the percentage of loss is about one-third of the entire
volume of such water, and at various other points in New Mexico, such
losses, more or less equal in percentage, are also shown to occur. The
evidence in this case failed to show that any such loss occurred between
San Marcial and El Paso in any year, except that of 1897, and there
being no evidence upon which to predicate the general conclusion drawn
by the court by its said findings.

1043

II.

The court erred in its 8th finding of fact, there being no evidence upon
which to base the general and particular conclusions contained therein.

III.

The court erred in its 9th finding of fact, there being no evidence upon
which to base the general and particular contentions contained therein.

IV.

The court erred in its 10th finding of fact to the effect that the Rio
Conchos is a perennial stream, and at all times contributes a considerable

quantity of water to the Rio Grande; such finding not being sustained by any evidence in the case, and the rest of the finding being a mere statement of a probative and not an ultimate fact.

V.

The court erred in its 11th finding of fact to the effect that the evidence fails to show that at the period mentioned therein the waters flowing by the mouth of the Conchos affected the height of the river at Laredo, Texas, to any considerable extent; said conclusion being uncertain, ambiguous, and misleading, incomplete and contrary to the evidence in the case, and is wholly immaterial, and because the particular facts found do not justify the general conclusion stated therein.

VI.

The court erred in its 17th finding of fact. The same is not based upon any evidence in the case, and is misleading, ambiguous, and the mere expression of opinion. If the conclusion reached by said findings is based upon any evidence at all it is upon the absence of evidence, and while affirmative in form, it is a negative conclusion and furnishes neither in whole or in part any basis for the decree and finding dismissing the bill in said cause.

1044

VII.

The court erred in its 28th finding of fact.

(a) The first paragraph of said finding is based upon the measurement of one flood flow in the year 1897, and that only between San Marcial and El Paso, and therefore is not a reasonable deduction from the evidence in the case.

(b) Because the second paragraph of said finding of fact 28th is not a finding of fact drawn from the evidence in the case, but is purely the result of speculation and not a fair deduction from the evidence.

(c) Because the third paragraph of said finding of fact 28th is not a finding of fact drawn from the evidence in the case, but is purely the result of speculation and not a fair deduction from the evidence.

(d) Because in the fourth paragraph of said finding of fact 28th the court is not justified in assuming an arbitrary percentage of loss by evaporation and seepage between Presidio del Norte and Rio Grande City, Texas, but such assumption must be based upon evidence in the case, and there is no evidence in the case from which such arbitrary percentage of loss can be determined.

(e) Because the assumptions and presumptions contained in paragraphs one to six of the said finding 28th are not based upon or sustained by any evidence in the case.

(f) Because the table (page 13½ of said findings of fact) made a part of said finding 28th is based upon the assumptions, presumptions, and speculative conclusions contained in the preceding six paragraphs of said finding 28th, and said assumptions cannot be made the basis of a conclusion by the court, nor said table, said assumptions being wholly unwarranted by any evidence in the case.

(g) The appellant assigns as error the remainder of said finding of fact 28th, explanatory of said statement, as being merely a theoretical and speculative discussion of the conditions of the river, and probable results which might flow from given conditions, not based on any evidence in the case, and because said finding is not properly a finding of fact, but a mere speculative opinion or theory.

VIII.

The court erred in its 30th finding of fact because it is based upon statements of fact not sustained by the evidence, and

(2) The court erred in said statement of fact in this, that the statement of facts contained in said finding does not justify the court in finding as a matter of fact and concluding therefrom that the amount of water proposed to be appropriated and impounded at Elephant Butte by the defendant will not substantially diminish the navigable capacity of the Rio Grande within its present limits of navigability.

IX.

The court erred in finding as a matter of law that the plaintiff's bill should be dismissed.

X.

The court erred in this, that none of the facts found by the court are sustained by the evidence in the case.

XI.

The court erred in refusing to reopen the case upon the application of the plaintiff, and to permit the plaintiff to obtain additional evidence to establish facts which the court itself found not to have been established, and without which no proper determination of the issues could be had, and the absence of such evidence and the possibility of procuring the same not having been apparent until the trial of the case.

XII.

The court erred in refusing to grant a rehearing of said case upon the offer of newly discovered evidence in said cause.

1046

XIII.

The court erred in refusing to grant a rehearing of said case upon the offer of the plaintiff to procure the evidence mentioned in assignment of error XI, together with the newly discovered evidence presented to the court by the affidavit of the proposed witness Clark and others; it being certain that the investigation which the plaintiff offered to have made, together with the newly discovered evidence, might, and probably would, change the result of the determination of the court as to the facts in the case.

XIV.

The court erred in refusing to make findings of fact asked for by the plaintiff numbered one (1), two (2), and twenty-one (21).

Wherefore, the appellant prays that the decree of said cause may be reversed.

(Signed)

WM. B. CHILDERS,
United States Attorney for the Territory of New Mexico,
and Attorney for Plaintiff.

(Signed)

M. C. BURCH,
Of Counsel.

And afterwards, on, to wit, at the said regular term of the supreme court of the Territory of New Mexico, on the thirty-sixth day thereof, the same being Wednesday, the second day of May, A. D. 1900, the following among other proceedings were had, as follows, to wit:

1047 THE UNITED STATES OF AMERICA,	} No. 879. Appeal from
appellant,	
<i>vs.</i>	
THE RIO GRANDE DAM AND IRRIGATION	district court, third ju-
Company et al., appellees.	dicial district.

This cause coming on to be heard upon the transcript of record, assignment of errors, and briefs of counsel, is argued by William B. Childers, United States district attorney, for appellant; and the argument in this case not being concluded, this case is hereby continued until to-morrow morning at ten o'clock a. m., and it is so ordered.

And afterwards, on, to wit, at the said regular term of the supreme court of the said Territory of New Mexico, on the thirty-seventh day thereof, the following among other proceedings were had, as follows, to wit:

THE UNITED STATES OF AMERICA,	} No. 879. Appeal from
appellant,	
<i>vs.</i>	
THE RIO GRANDE DAM AND IRRIGATION	3rd judicial district
Company et al., appellees.	court.

This cause again coming on to be heard upon the transcript of record, assignment of errors, and briefs of counsel, is further argued by A. B. Fall, esq., for appellees, and W. B. Childers, esq., for appellants, and submitted to the court; and the court, not being sufficiently advised in the premises, takes the same under advisement.

And afterwards, to wit, at the said regular term of the said supreme court, on the thirty-seventh day thereof, the following among other proceedings were had, as follows, to wit:

1048 THE UNITED STATES OF AMERICA,	} No. 879. Appeal from
appellant,	
<i>vs.</i>	
THE RIO GRANDE DAM AND IRRIGATION	third judicial district
Company et al., appellees.	court.

This cause coming on before the court upon a motion of appellant for time in which to file briefs, and the court being fully advised in the

premises, it is therefore considered and adjudged by the court that the said appellant do have thirty days in which to file his brief, and that the appellee have thirty days thereafter in which to reply, and it is so ordered.

And afterwards, to wit, at the said regular term of the said supreme court, on the thirty-ninth day thereof, the same being Friday, the 24th day of August, the following among other proceedings were had, as follows, to wit:

UNITED STATES OF AMERICA, APPELLANT,	} No. 879. Appeal from third judicial district court.
<i>vs.</i>	
THE RIO GRANDE DAM AND IRRIGATION Company et al., appellee.	

This cause having been argued by counsel and submitted to and taken under advisement by the court upon a former day of the present term, and the court being now sufficiently advised in the premises, announces its decision by Chief Justice Mills, Associate Justices McFie and Crumpacker concurring, affirming the judgment of the court below, for reasons stated in the opinion of the court on file. It is therefore considered and adjudged by the court that the judgment of the district court in and for the third judicial district, whence this cause came into this court, 1049 be, and the same hereby is, affirmed, and that, in accordance therewith, it is considered, adjudged, and decreed by the court that the bill of complaint of the appellants herein be, and the same hereby is, dismissed. It is further ordered, adjudged, and decreed by the court that the appellees do have and recover of and from the appellant their costs in this behalf expended, in this court as well as in the court below to be taxed, and it is so ordered.

And afterwards, to wit, at the said regular term of the said supreme court, on the thirty-ninth day thereof, the same being the 24th day of August, A. D. 1900, the following among other proceedings were had, as follows, to wit:

THE UNITED STATES OF AMERICA,	} No. 879. Appeal from district court, third ju- dicial district court.
appellant,	
<i>vs.</i>	
THE RIO GRANDE DAM AND IRRIGATION Company et al., appellee.	

Now comes W. B. Childers, United States attorney, and moves to the court that it make a statement of facts in the above-entitled cause, and the court, being sufficiently advised in the premises, adopts as its own the statement of facts made by the court below. It is therefore considered and adjudged by the court that this court adopts as its own statement of facts the statement of facts as made by the district court in and for the third judicial district, whence this cause came into this court, and it is so ordered.

And afterwards, to wit, on the 14th day of November, A. D. 1900, there was filed in the office of the clerk of the supreme court the fol-

lowing motion and order of appeal, which said motion for an appeal and order of allowance of the same is in words and figures as follows, to wit:

1050 In the supreme court of the Territory of New Mexico, January term, A. D. 1900.

THE UNITED STATES OF AMERICA, PLAINTIFF AND	} No. 879.
appellant,	
<i>vs.</i>	
THE RIO GRANDE DAM AND IRRIGATION COMPANY,	
defendant and appellee.	

Motion for appeal.

The United States, by their attorney, W. B. Childers, United States attorney for the Territory of New Mexico, feeling themselves aggrieved by the order and judgment entered on the 24th day of August, A. D. 1900, in the above-entitled cause, do hereby appeal from the said order, judgment, and decree of the said supreme court of the Territory of New Mexico to the Supreme Court of the United States, and pray that their appeal may be allowed and that a transcript of record, proceedings, and papers therein, duly authenticated, may be sent to the said Supreme Court of the United States.

(Signed)

WILLIAM B. CHILDERS,
United States Attorney for the Territory of New Mexico.

UNITED STATES OF AMERICA, PLAINTIFF AND	} No. 879.
appellant,	
<i>vs.</i>	
RIO GRANDE DAM AND IRRIGATION COMPANY,	
defendant and appellee.	

Order allowing appeal.

Now, on, to wit, the 13th day of November, A. D. 1900, it is
1051 ordered that the appeal above prayed for be allowed from the said decree and judgment of the court entered in said above-entitled cause on the said 24th day of August, A. D. 1900.

And it is further ordered that the said appellant have leave to file assignments of error and make the same a part of the record in said cause at any time before the final authentication of the record in said cause, by the clerk, or at any time after the said cause may be docketed in the Supreme Court of the United States.

And it is further ordered that citation issue in said cause, to be served upon the counsel for the said appellees, as required by the statutes and rules of court.

(Signed)

WILLIAM J. MILLS,
Chief Justice of the Supreme Court of the Territory of New Mexico;

And afterwards, to wit, on the 14th day of November, A. D. 1900, in vacation, the following proceedings were had and entered of record as follows, to wit:

IN VACATION, WEDNESDAY,
November 14th, A. D. 1900.

Present, Hon. William J. Mills, chief justice; William B. Childers, U. S. attorney; Jose D. Sena, clerk.

UNITED STATES OF AMERICA, PLAINTIFF and appellant, <i>vs.</i> RIO GRANDE DAM AND IRRIGATION COM- pany et al., defendants and appellees.	}	No. 879. Appeal from dis- trict court, third judicial district.
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Motion for appeal.

The United States, by their attorney, W. B. Childers, United States attorney for the Territory of New Mexico, feeling themselves
1052 aggrieved by the order and judgment entered on the 24th day of August, A. D. 1900, in the above-entitled cause, do hereby appeal from the said order, judgment, and decree of the said supreme court of the Territory of New Mexico to the Supreme Court of the United States, and pray that their appeal may be allowed and that a transcript of record, proceedings, and papers therein, duly authenticated, may be sent to the said Supreme Court of the United States.

(Signed) WILLIAM B. CHILDERS,
United States Attorney for the Territory of New Mexico.

UNITED STATES OF AMERICA, PLAINTIFF and appellant, <i>vs.</i> RIO GRANDE DAM & IRRIGATION Co., et al., defendants and appellees.	}	No. 879. Appeal from dis- trict court, third judicial district.
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Order allowing appeal.

Now, on, to wit, the 13th day of November, A. D. 1900, it is ordered that the appeal above prayed for be allowed, from the said decree and judgment of the court entered in said above-entitled cause on the said 24th day of August, A. D. 1900.

And it is further ordered that the said appellant have leave to file assignment of error and make the same a part of the record in said cause by the clerk, or at any time after the said cause may be docketed in the Supreme Court of the United States.

And it is further ordered that citation issue in said cause, to be served upon the counsel for the said appellees, as required by the statutes and rules of court.

(Signed) WILLIAM J. MILLS,
Chief Justice of the Supreme Court of the Territory of N. M.

1053 And afterwards, on, to wit, the 14th day of November there was filed in the office of the clerk of the supreme court of the Territory of New Mexico, an assignment of errors to be returned as a part of the record on appeal to the Supreme Court of the United States, which said assignment of error was and is in words and figures, as follows, to wit:

In the supreme court of the Territory of New Mexico.

THE UNITED STATES OF AMERICA, APPELLANT,	}
<i>vs.</i>	
THE RIO GRANDE DAM AND IRRIGATION COM-	}
pany, et al., appellees.	

Assignment of errors to be returned as a part of the record on appeal to the Supreme Court of the United States.

Now comes the above-named appellant, and says that there is manifest error in the record, proceedings, and decree of the supreme court of New Mexico in the above-entitled cause, in this, to wit:

I.

The supreme court of the Territory erred in not sustaining the first assignment of error, and reversing the decree of the district court on account of the error thereby assigned, which assignment of error is as follows, to wit: "The court erred in its 7th finding of fact to the effect, that between San Marcial and El Paso, a distance of 300 miles, measured by the sinuosities of the river, the percentage of loss is about one-third of the entire volume of such water, and at various other points in New Mexico such losses, more or less equal in percentage, are also shown to occur. The evidence in this case failed to show that any such loss occurred between San Marcial and El Paso in any year except
1054 that of 1897, and there being no evidence upon which to predicate the general conclusion drawn by the court by its finding.

II.

The supreme court of the Territory erred in not sustaining the second assignment of error, and reversing the decree of the district court on account of the error thereby assigned, which assignment of error is as follows, to wit: "The court erred in its 8th finding of fact, there being no evidence upon which to base the general and particular conclusions contained therein."

III.

The supreme court of the Territory erred in not sustaining the third assignment of error, and reversing the decree of the district court on account of the error thereby assigned, which assignment of error is as follows, to wit: "The court erred in its 9th finding of fact, there being no evidence upon which to base the general and particular conclusions contained therein."

IV.

The supreme court of the Territory erred in not sustaining the fourth assignment of error, and reversing the decree of the district court on account of the error thereby assigned, which assignment of error is as follows, to wit: "The court erred in its 10th finding of fact to the effect that the Rio Conchos is a perennial stream and at all times contributes a considerable quantity of water to the Rio Grande; such finding not being sustained by any evidence in the case, and the rest of the finding being a mere statement of a probative and not an ultimate fact."

V.

The supreme court of the Territory erred in not sustaining the 1055 fifth assignment of error, and reversing the decree of the district court on account of the error thereby assigned, which assignment of error is as follows, to wit: "The court erred in its 11th finding of fact, to the effect that the evidence fails to show that at the period mentioned therein the waters flowing by the mouth of the Conchos affected the height of the river at Laredo, Texas, to any considerable extent; said conclusions being uncertain, ambiguous, and misleading, incomplete, and contrary to the evidence in the case, and is wholly immaterial, and because the particular facts found do not justify the general conclusion stated therein."

VI.

The supreme court of the Territory erred in not sustaining the sixth assignment of error, and reversing the decree of the district court on account of the error thereby assigned, which assignment of error is as follows, to wit: "The court erred in its 17th finding of fact. The same is not based upon any evidence in the case, and is misleading, ambiguous, and the mere expression of opinion. If the conclusion reached by said finding is based upon any evidence at all, it is upon the absence of evidence, and while affirmative in form, it is a negative conclusion, and furnishes neither in whole or in part any basis for the decree and finding dismissing the bill in said cause."

VII.

The supreme court of the Territory erred in not sustaining the seventh assignment of error, and reversing the decree of the district court on account of the error thereby assigned, which assignment of error is as follows, to wit:

"The court erred in its 28th finding of fact,

"(a) The first paragraph of said finding is based upon the measurement of one flood flow in the year 1897, and that only between San Marcial and El Paso, and therefore is not a reasonable deduction 1056 from the evidence in the case.

"(b) Because the second paragraph of said finding of fact 28th is not a finding of fact drawn from the evidence in the case, but is purely the result of speculation and not a fair deduction from the evidence.

"(c) Because the third paragraph of said finding of fact 28th is not a finding of fact drawn from the evidence in the case, but is purely the result of speculation and not a fair deduction from the evidence.

"(d) Because in the fourth paragraph of said finding of fact 28th, the court is not justified in assuming an arbitrary percentage of loss by evaporation and seepage between Presidio del Norte and Rio Grande City, Texas, but such assumption must be based upon evidence in the case, and there is no evidence in the case from which such arbitrary percentage of loss can be determined.

"(e) Because the assumptions and presumptions contained in paragraph one to six of said finding 28th are not based upon or sustained by any evidence in the case.

"(f) Because the table (page 13½ of said findings of fact), made a part of said finding 28th, is based upon the assumptions, presumptions, and speculative conclusions contained in the preceding six paragraphs of said finding 28th, and said assumptions can not be made the bases of a conclusion by the court, not said table, said assumptions being wholly unwarranted by any evidence in the case.

"(g) The appellant assigns as error the remainder of said finding of fact 28th, explanatory to said statement, as being merely a theoretical and speculative discussion of the conditions of the river, and probable results which might flow from given conditions, not based on any evidence in the case, and because said finding is not properly a finding of fact, but a mere speculative opinion or theory."

1057

VIII.

The supreme court of the Territory erred in not sustaining the eight assignment of error, and reversing the decree of the district court on account of the error thereby assigned, which assignment of error is as follows, to wit:

"The court erred in the 30th finding of fact, because it is based upon statements of facts not sustained by the evidence, and

"(2) The court erred in said statement of fact in this, that the statement of facts contained in said finding does not justify the court in finding as a matter of fact and concluding therefrom that the amount of water proposed to be appropriated and impounded at Elephant Butte by the defendant will not substantially diminish the navigable capacity of the Rio Grande within the present limits of navigability.

IX.

The supreme court of the Territory erred in not sustaining the ninth assignment of error, and reversing the decree of the district court on account of the error thereby assigned, which assignment is as follows, to wit: "The court erred in finding as a matter of law that the plaintiff's bill should be dismissed."

X.

The supreme court of the Territory erred in not sustaining the tenth assignment of error, and reversing the decree of the district court on

account of the error thereby assigned, which assignment of error is as follows, to wit: "The court erred in this, that none of the facts found by the court are sustained by the evidence in the case."

XI.

The supreme court of the Territory erred in not sustaining the eleventh assignment of error, and reversing the decree of the district court on account of the error thereby assigned, which
1058 assignment of error is as follows, to wit: "The court erred in refusing to reopen the case upon the application of the plaintiff, and to permit the plaintiff to obtain additional evidence to establish facts which the court itself found not to have been established, and without which no proper determination of the issues could be had, and the absence of such evidence and the possibility of procuring the same not having been apparent until the trial of the case."

XII.

The supreme court of the Territory erred in not sustaining the twelfth assignment of error and reversing the decree of the district court on account of the error thereby assigned, which assignment of error is as follows, to wit: "The court erred in refusing to grant a rehearing of said case upon the offer of newly discovered evidence in said cause."

XIII.

The supreme court of the Territory erred in not sustaining the thirteenth assignment of error, and reversing the decree of the district court on account of the error thereby assigned, which assignment of error is as follows, to wit: "The court erred in refusing to grant a rehearing of said case upon the offer of the plaintiff to procure the evidence mentioned in assignment of error XI, together with the newly discovered evidence presented to the court by the affidavit of the proposed witness Clark and others, it being certain that the investigation which the plaintiff offered to have made, together with the newly discovered evidence might, and probably would, change the result of the determination of the court as to the facts in the case."

XIV.

1059 The supreme court of the Territory erred in not sustaining the fourteenth assignment of error and reversing the decree of the district court on account of the error thereby assigned, which assignment of error is as follows, to wit: "The court erred in refusing to make findings of fact asked for by the plaintiff, numbered one (1), two (2), and twenty-one (21)."

XV.

The supreme court of the Territory erred in adopting the findings of fact made by the district court.

XVI.

The supreme court of the Territory erred in affirming the decree of the district court rendered in said cause.

Wherefore, the appellant prays that the decree of the supreme court of New Mexico, rendered in said cause, be reversed.

(Signed)

W. B. CHILDERS,
United States Attorney for the Territory of New Mexico,
and Attorney for Plaintiff.
M. C. BURCH, *Of Counsel.*

And heretofore, on, to wit, the 24th day of August, A. D. 1900, there was filed in the office of the clerk of the supreme court of the Territory of New Mexico an opinion by the court, which said opinion is in the words and figures as follows, to wit:

1060 In the supreme court, Territory of New Mexico. January term, 1900.

UNITED STATES OF AMERICA, APPELLANT,	} No. 879. Appeal
<i>versus</i>	
THE RIO GRANDE DAM AND IRRIGATION COM-	} from the district
pany et al., appellees.	
	} court of the third
	} judicial district.

William B. Childers, esqr., United States attorney for the district of New Mexico, attorney for appellant; W. A. Hawkins, esqr., A. B. Fall, esqr., and John Franklin, esqr., attorneys for appellees.

The bill of complaint in this suit was originally filed on May 24th, 1897, on behalf of the United States, by their Attorney-General, in the district court of the third judicial district of New Mexico, against the Rio Grande Dam and Irrigation Company, the purpose of which was to restrain the defendant from constructing a dam across the Rio Grande, in the Territory of New Mexico, and appropriating the waters of that stream for the purpose of irrigation. The cause was tried before the judge of said court and a decree entered dismissing the bill. The United States appealed to this court, where the judgment of the district court was affirmed. (9th N. M., p. 392.) Thereupon the United States appealed to the Supreme Court of the United States, where the decree of this court was reversed and the cause remanded with instructions to set aside the decree of dismissal and to order an inquiry into the question whether the intended acts of the defendants in the construction of a dam and appropriating the waters of the Rio Grande would substantially diminish the navigability of that stream within the limits of present navigability, and if so to enter a decree restraining those acts to the extent that they will so diminish. (U. S. vs. Rio Grande Dam & Irrigation Co., 174 U. S., p. 690.)

In accordance with the judgment and mandate of the Supreme Court of the United States the cause was remanded to the district court of the third judicial district of the Territory, and beginning on December 12th, 1899, the cause was heard before the judge of said court. At the conclusion of said hearing, on the first day of January, A. D. 1900, the

judge of said court made his findings of fact and ordered that a decree be prepared and entered dismissing the bill of complaint. Thereafter a motion for rehearing was filed and overruled, and on the ninth day of January, A. D. 1900, a final decree was made and entered dismissing the bill. Thereupon the appellant prayed an appeal to this court, which was granted.

The appellant files the following assignments of error :

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I.

The court erred in its seventh finding of fact to the effect that between San Marcial and El Paso, a distance of three hundred miles measured by the *sinuosities* of the river, the percentage of loss is about one-third of the entire volume of such water, and at various other points in New Mexico such losses, more or less, equal in percentage, are also shown to occur. The evidence in this case failed to show that any such loss occurred between San Marcial and El Paso in any year, except that of 1897, and there being no evidence upon which to predicate the general conclusion drawn by the court by its said finding.

II.

The court erred in its eighth finding of fact, there being no evidence upon which to base the general and particular conclusions contained therein.

III.

The court erred in its ninth finding of fact, there being no evidence upon which to base the general and particular conclusions contained therein.

IV.

The court erred in its tenth finding of fact to the effect that the Rio Conchus is a peren'ial stream and at all times contributes a considerable quantity of water to the Rio Grande, such finding not being sustained by any evidence in the case, and the rest of the finding being a mere statement of a probative and not an ultimate fact.

V.

The court erred in its eleventh finding of fact to the effect that the evidence fails to show that at the period mentioned therein, the waters flowing by the mouth of the Conchus affected the height of the river at Laredo, Texas, to any considerable extent; said conclusion being uncertain, ambiguous, and misleading, incomplete, and contrary to the evidence in the case, and is wholly immaterial, and because the particular facts found do not justify the general conclusion stated therein.

VI.

The court erred in its seventeenth finding of fact; the same is not based upon any evidence in the case, and is misleading, ambiguous, and

the mere expression of opinion. If the conclusion reached by said finding is based upon any evidence at all it is upon the absence of evidence, and while affirmative in form it is a negative conclusion, and furnishes neither in whole nor in part any basis for the decree and finding dismissing the bill in said cause.

VII.

The court erred in its twenty-eighth finding of fact:

(a) The first paragraph of said finding is based upon the measurement of one flood flow in the year 1897, and that only between San Marcial and El Paso, and therefore is not a reasonable deduction from the evidence in the case.

(b) Because the second paragraph of said finding of fact, twenty-eighth, is not a finding of fact drawn from the evidence in the case, but is purely the result of speculation, and not a fair deduction from the evidence.

1064 (c) Because the third paragraph of said finding of fact 28th is not a finding of fact drawn from the evidence in the case, but is purely the result of speculation and not a fair deduction from the evidence.

(d) Because in the fourth paragraph of said finding of fact 28th the court is not justified in assuming an arbitrary percentage of loss by evaporation and seepage between Presidio del Norte and Rio Grande City, Texas, but such assumption must be based upon evidence in the case, and there is no evidence in the case from which such arbitrary percentage of loss can be determined.

(e) Because the assumptions and presumptions contained in paragraphs 1 to 6 of said finding 28th, are not based upon or sustained by any evidence in the case.

(f) Because the table (page 13½ of said findings of fact) made a part of said finding 28th is based upon the assumptions, presumptions, and speculative conclusions contained in the preceding six paragraphs of said finding 28th, and said assumptions cannot be made the basis of a conclusion by the court nor said table, said assumptions being wholly unwarranted by any evidence in the case.

(g) The appellant assigns as error the remainder of said finding of fact 28th, explanatory of said statement, as being merely a theoretical and speculative discussion of the conditions of the river, and probable results which might flow from given conditions, not based on any evidence in the case, and because said finding is not properly a finding of fact, but a mere speculative opinion or theory.

VIII.

The court erred in its thirtieth finding of fact, because it is based upon statements of fact not sustained by the evidence, and (2nd) the court erred in said statement of fact, in this, that the statement of facts contained in said finding does not justify the court in finding, as a matter of fact, and concluding therefrom that the amount of water proposed
1065 to be appropriated and empounded at Elephant Butte by the defendant, will not substantially diminish the navigable capacity of the Rio Grande within the present limits of navigability.

IX.

The court erred in finding, as a matter of law, that the plaintiff's bill should be dismissed.

X.

The court erred in this, that none of the facts found by the court are sustained by the evidence in the case.

XI.

The court erred in refusing to reopen the case upon the application of the plaintiff and to permit the plaintiff to obtain additional evidence to establish facts which the court itself found not to have been established, and without which no proper determination of the issues could be had, and the absence of such evidence and the possibility of procuring the same not having been apparent until the trial of the case.

XII.

The court erred in refusing to grant a rehearing of said case upon the offer of newly-discovered evidence in said cause.

XIII.

The court erred in refusing to grant a rehearing of said case upon the offer of the plaintiff to procure the evidence mentioned in assignment of error XI, together with the newly-discovered evidence presented to the court by the affidavit of the proposed witness Clark, and others, it being certain that the investigation which the plaintiff offered to have made, together with the newly-discovered evidence, might, and probably would, change the result of the determination of the court as to the facts in the case.

XIV.

The court erred in refusing to make findings of fact asked for by the plaintiff, numbered 1, 2, and 21.

1066 The judge of the district court who tried this case made the following findings of fact:

I.

The Rio Grande is navigable only between the American points of Rio Grande City and the mouth of such river, a distance of 262 miles measured by the sinuosities of the stream. It is navigated only between Rio Grande City and Brownsville, Texas, a distance of 177 miles by such sinuosities.

II.

That such navigation began to decline on account of scarcity of water in such river in 1898, and has continued to so decline until at the present

time the same consists of occasional trips of small vessels of about 100 tons capacity. Such trips are irregular and uncertain and so spasmodic as to time as to render such navigation of small benefit to commerce between points reached thereby.

III.

That the decline of such navigation has been occasioned by a gradual decline of the navigable capacity of such river and the increased difficulty of navigating the same on account of scarcity of water, compelling the substitution from time to time of boats of less capacity.

IV.

The scarcity of water in said river when it is navigable is due largely to a drouth of great severity, which has continued with only occasional interruptions since about 1887, and has extended over a vast area of country several hundred miles in width and length along the general course of said river from its mouth up, and which has both affected portions of Texas and Mexico, and to drying up of the following-named tributaries of such river, lying either in Texas or Mexico, to wit: Elm Creek, 1067 Los Moras, Piedras Pintas, Sycamore, San Felipe, Escondido, San Diego, Las Bacas, Trientauno, Santa Carlo, Cienegas, and Selado, all referred to in the report of Major Emory, as well as described by the witnesses in this case, and all of which were, from ten to eighteen years ago, bold running streams.

V.

There is no evidence from which the court can estimate the extent of the diminution of such rainfall or from which it can determine that there has been a permanent change in the amount of rainfall in said region, or the amount of such effect of such diminution of rainfall and drying up of streams has had upon the navigable capacity of said river since the commencement of this suit in May, 1897.

VI.

At the measuring station at San Marcial, forty miles above Elephant Butte, the Rio Grande is shown, from evidence and measurements filed in this case, to be largely a torrential stream, varying from dry bed to floods of considerable size and duration, and this torrential flow characterizes its entire course through New Mexico.

VII.

In its course, both in Colorado and New Mexico, a large percentage of its waters are constantly lost by causes not accurately determined, but generally classed as seepage and evaporation, and between San Marcial, New Mexico, and El Paso, Texas, a distance of three hundred miles, measured by the sinuosities of the river, it is shown that the percentage of loss from such causes is about one-third of the entire volume of such water, and at various other points in New Mexico such losses, more or less equal in percentage, are also shown to occur.

VIII.

While there are no measurements from which the percentage of
 1068 loss by evaporation from the volume of water after the same passes
 El Paso, Texas, can be definitely determined, yet the general character of the bed, banks, formation, and soil is shown to be the same general character as that portion of such stream lying between San Marcial and El Paso, where such large losses in volume have been accurately determined, and that for a distance of four hundred miles below El Paso, Texas, measured by the sinuosities of the river, to Presidio del Norte, such seepage and evaporation continues to diminish the volume of such water.

IX.

Between Elephant Butte, the point where defendants proposed to divert the waters of such stream, and Presidio del Norte, a distance of six hundred and forty miles by the sinuosities of the stream, there are no living tributaries to said Rio Grande, and the waters of such stream are not reinforced substantially between such points by any regular flow or tributary, and there is no perennial flow of the Rio Grande at Presidio del Norte.

X.

The first perennial tributary of the Rio Grande below Elephant Butte is the Conchus, which comes into the Rio Grande at Presidio del Norte. The Conchus is a perennial stream, rising in the mountains of northern Mexico and flowing several hundred miles northerly into the Rio Grande. In season it is a torrential stream of great magnitude, and at all times carries a considerable quantity of water. A cross section of the Rio Grande near and just below where the Conchus joins it shows an area at least twenty-five times as great as the area of a cross section of the Rio Grande just above the mouth of the Conchus, measured to the highest watermark known, so far as disclosed by the evidence, in thirty-three years, the carrying capacity of the lower cross section being variously estimated at from sixteen to twenty-five times as great as the upper cross section.

1069

XI.

It has only been shown by the evidence that the waters in the Rio Grande bed passed Presidio del Norte, the mouth of the Conchus, in considerable quantities upon one occasion—that is, during the month of May, 1897; but it is fairly inferable from the testimony that such waters have so passed such point on other occasions in such quantities. No evidence has been offered as to the amount then so passing the mouth of the Conchus, in the Rio Grande bed, except that of one witness to the effect that the height of the same over a ford some distance below the mouth of the Conchus (the dimensions of the river at that point not being shown) was increased about three feet, and the duration of its passage at such height was for about eight or ten days, and except some estimates based upon

the surface area of the cross sections referred to, showing the flow to be 3,250 cubic feet per second, and I find that the evidence fails to show at the period mentioned the waters so flowing by the mouth of the Conchos affected the height of the river at Laredo, Texas, to any considerable extent.

XII.

It appears from the evidence that the Rio Grande was navigated in a common rowboat, drawing about six inches of water, during the winter season of 1893-4, from El Paso, Texas, to the mouth of the Conchos, a distance estimated at 400 miles by the sinuosities of the stream, at a stage of water from three to three and one-half feet deep at El Paso, Texas, at the time of starting, said trip occupying twenty-one days, and without finding any obstructions in said stream except scarcity of water for the last forty miles above the mouth of the Conchos; that after remaining a period of eighteen days in the vicinity of Presidio del Norte the party making said trip embarked upon water said to have been furnished from the Rio Conchos and continued to Del Rio, Texas, a distance of 562 miles by the sinuosities of the stream.

1070

XIII.

There is no evidence in the case tending to show that there is any obstruction to the free and uninterrupted flow of the Rio Grande from Del Rio, Texas, to Rio Grande City, Texas.

XIV.

There is no evidence in the case tending to show that water which has reached Del Rio, Texas, would not uninterruptedly continue to flow to Rio Grande City, Texas, except such portions thereof as may be lost by seepage or evaporation.

XV.

The Conchos River enters the Rio Grande from the Mexican side at nearly right angles. On the lower or southerly side of the Conchos there is elevated ground, upon which is situated the village of Presidio del Norte. On the upper or northerly side of the Conchos, and on the western or Mexican bank of the Rio Grande, the land is low and subject to much overflow. On the American side of the Rio Grande, at the mouth of the Conchos, the banks are high and not subject to overflow.

XVI.

The distance by the sinuosities of the river between Presidio del Norte and Rio Grande City is something over 900 miles, and the bed of the stream between such points appears to be practically a succession of basins or valleys of greater or less extent, and of the same character and affording

the same facilities for absorbing the water as the valleys above El Paso or those above the mouth of the Conchos, and I find that large amounts of water flowing between the Conchos and Rio Grande City are lost between said points by evaporation and seepage.

XVII.

The character of the formation in the basins or valleys of the Rio Grande at the only point where the same has been sounded to any great depth—that is, by the boundary commission at El Paso, Texas—1071 show the depth of sand and gravel to be at least sixty feet, and I can see no reason why the other valleys and basins along the course of the Rio Grande should not show the same formation to at least the same depth, the surface indications and appearance being substantially the same throughout its length.

XVIII.

The watershed of the Rio Grande and its tributaries above Elephant Butte is approximately twenty-five thousand square miles in extent. The watershed between Elephant Butte and El Paso is approximately 5,700 square miles. The watershed from Elephant Butte to Rio Grande City of the Rio Grande and its tributaries, after deducting the area of such basins as may not find an outlet into the stream, is approximately 170,000 square miles. The source of supply of the water flowing past Rio Grande City at the head of navigation is largely this comparatively enormous watershed of 170,000 square miles below Elephant Butte, feeding with tropical rains the Conchos and San Juan particularly, rising far south in the mountains of Mexico, and flowing north into the Rio Grande, and also affording a supply for the Pecos, Devils River, the Good Enough, and other perennial streams, as well as the decreased but still flowing waters of the San Felipe and Salado, and at times filling with floods the now dry beds of the former perennial streams heretofore referred to as well as many smaller streams not named.

XIX.

Records have been kept of the flow of the water passing El Paso, Texas, for the part of the year 1889 and for the years 1890, 1891, 1892, part of 1893, 1897, 1898, and part of 1899. No records were kept for any other years. These records so kept show the amount of water passing El Paso for said years respectively to be as follows, viz:

1072	From May 1st to Dec. 31st, 1899	370,000	acre-feet
	1890	971,000	" "
1891		1,943,000	" "
1892		941,000	" "
Jan. 1st to July 1st, 1893.....		329,000	" "
1897		1,369,000	" "
1898		689,000	" "
From January 1st to Sept. 1st, 1899		70,000	" "

The river, after having been dry, commenced to run about December 10, 1899.

XX.

The evidence shows that certain cross sections were taken by a member of the International (Water) Boundary Commission at a certain point one mile below Rio Grande City, Texas, which indicates the amount of water required to raise the river at that point, as appears from the following table:

Estimated flow of Rio Grande one mile below Rio Grande City, Texas. Conditions assumed—river at low water, sudden rise comes, rising 1 ft. in 4 hours at first, and going up to high water.

Stage of river.	Cross sect., sq. ft.	Fall.	Current.	Flow sec. ft.	Add for possible scour.	Max. flow sec. ft.	Added water for rise.	
Low water.....	1,226	1:7000	1.63 ft. sec...	1,998	.....	1,998	343 s. f. ...	
1 ft. rise	1,591	1:6950	1.90 " ..	3,023	16.....	3,053	1,398 "	1,655 s. f. at low water.
2 "	1,971	1:6800	2.14 " ..	4,218	2".....	4,302	2,647 "	
3 "	2,363	1:6850	2.40 " ..	5,671	3".....	5,841	4,186 "	
4 "	2,765	1:6800	2.64 " ..	7,300	4".....	7,592	5,937 "	
5 "	3,167	1:6750	2.88 " ..	9,121	5".....	9,597	7,922 "	
6 "	3,594	1:6700	3.12 " ..	11,213	6".....	11,886	10,231 "	
7 "	4,018	1:6650	3.33 " ..	13,380	7".....	14,316	12,651 "	
8 "	4,448	1:6600	3.52 " ..	15,657	8".....	16,909	15,254 "	
9 "	4,883	1:6550	3.73 " ..	18,214	9".....	19,853	18,198 "	
10 "	5,324	1:6500	3.92 " ..	20,770	10".....	22,957	21,302 "	
11 "	5,770	1:6500	4.10 " ..	23,675	2 ".....	26,023	24,368 "	
12 "	6,222	1:6600	4.24 " ..	26,381	".....	29,019	27,364 "	
13 "	6,678	1:6700	4.39 " ..	29,316	".....	32,248	30,593 "	
14 "	7,139	1:6800	4.53 " ..	32,340	".....	35,574	33,919 "	
15 "	7,604	1:6900	4.66 " ..	35,435	".....	38,978	37,323 "	
16.1 "	8,123	1:7000	4.80 " ..	38,990	".....	42,889	41,234 "	
After passing 11 ft. this does not show all of flood flow, as water would begin at this height to leave river above cross section.								
Flow at low water.	1,226	1:10000	1.35 ft. sec...	1,655				
Flow Dec., 1897, 2.1 ft. up.	2,009	1:10000	1.84 " ..	3,697				

1073

XXI.

The evidence shows that a cross section was also taken twenty-one miles (by river) above Brownsville, Texas, and shows the capacity of the river at said point to be as follows:

Estimated flow of Rio Grande, 21 miles (by river) above Brownsville, Texas. Conditions assumed. River at low water. Sudden rise comes, rising 1 ft. in 4 hours at first, and going on up to high water.

State of river.	Cross sect., sq. ft.	Fall.	Current.	Flow, sec. ft.	Add for possible scour.	Max. flow, sec. ft.	Added water for rise.
Low water	1,198	1:6300	1.60 ft. sec...	1,917	.....	1,917	336 s. f.
1 ft. rise	1,588	1:6200	1.92 " ..	3,045	1 ".....	3,079	1,400 "
2 ft. rise	1,989	1:6100	2.24 " ..	4,455	2 ".....	4,544	2,963 "
3 ft. rise	2,396	1:6000	2.55 " ..	6,110	4 ".....	6,354	4,773 "
4 "	2,808	1:5900	2.84 " ..	7,975	5 ".....	8,373	6,792 "
5 "	3,223	1:5800	3.11 " ..	10,023	7 ".....	10,724	9,145 "
6 "	3,641	1:5800	3.37 " ..	12,270	9 ".....	13,252	11,671 "
7 "	4,062	1:5750	3.60 " ..	14,623	11 ".....	15,939	14,358 "
8 "	4,485	1:5700	3.82 " ..	17,133	13 ".....	18,846	17,265 "
9 "	4,913	1:5600	4.03 " ..	19,800	15 ".....	21,780	20,199 "
10 "	5,344	1:5500	4.24 " ..	22,284	".....	24,512	22,931 "
11 "	5,777	1:5400	4.48 " ..	24,725	".....	27,197	25,616 "
12.1" H. W.	6,257	1:5300	4.72 " ..	27,656	".....	30,421	28,840 "
After passing 8 ft. or 9 ft. this does not show all of flood flow, as water would begin at this height to leave river channel above cross section.							
Flow at low water, no rise ...	1,198	1:5000	1.32.....	1,581			
Flow Feb. 24-98, 1.3 ft. up....	1,700	1:5000	1.66.....	2,822			

XXII.

The testimony in the case shows the following table of distances, viz:

1674

Distances along Rio Grande, scaled from map.

From—	To—	Distance by channel.	Distance along axis.
Headwaters	Del Norte		80 miles.
Del Norte	Colorado State line	65 "	"
State line	Embudo	65 "	"
Embudo	White Rock Cañon	30 "	"
White Rock Cañon	(Length)	15 "	"
White Rock Cañon	Albuquerque	50 "	"
Albuquerque	San Marcial	105 "	"
San Marcial	Elephant Butte	40 "	"
Elephant Butte	Fort Seldon	65 "	"
Fort Seldon	El Paso	60 "	"
El Paso	Lower end El Paso Valley	80 "	"
Lower end valley	Mouth of Conchos River	125 "	"
Mouth of Conchos	Mouth of Pecos	250 "	"
Mouth Pecos	Mouth Devils River	35 "	"
Mouth Devils River	Eagle Pass	65 "	"
Eagle Pass	Laredo	110 "	"
Laredo	Mouth Salado River	70 miles ..	55 "
Mouth Salado	Mouth Alamo	50 "	35 "
Alamo	Roma	8 "	5 "
Roma	Mouth of San Juan	12 "	10 "
Mouth San Juan	Rio Grande City	2 "	2 "
Rio Grande City	Brownsville	177 "	95 "
Brownsville	Mouth Rio Grande	85 "	30 "

XXIII.

The propose^d dam and reservoir of the defendants would contain 11,036,722,000 cubic feet of water, or 253,370 acre-feet of water.

XXIV.

The defendants propose to irrigate 230,000 acres of valley and 300,000 acres of mesa lands; in all, 530,000 acres. In accordance with the amount of water used in Colorado and New Mexico for irrigating land it will require 954,000 acre-feet of water to irrigate that quantity of land proposed to be irrigated by defendants, or from three to four times the capacity of said reservoir.

1075

XXV.

The testimony shows the following to be the time it would have taken all the flow of the Rio Grande to have filled the Elephant Butte reservoir, supposing it to hold 253,000 acre-feet during the maximum flow in each year, from El Paso gauging station, viz:

1899. All of May flow, and 8 or 10 days of June flow	40 days.
1890. From May 15th to June 3rd	19 "
1891. From May 12th to May 20th	9 "
1892. From May 2nd to May 17th	16 "
1893. From April 25th to May 31st	37 "
1897. From May 24th to June 3rd	11 "
1898. Two floods—April 22nd to May 8th, and July 17th to July 25th	26 "
1899. No flood. Total flow for year only 70,000 acre-feet at El Paso.	

XXVI.

The testimony shows the time necessary each year to fill the proposed Elephant Butte reservoir of the defendants, supposing it held 253,000 acre-feet, and starting at the beginning of spring flood and allowing enough water to pass proposed dam to supply all ditches below it (assuming this amount to be 500 second-feet for the El Paso Valley) would be as follows, viz:

1899.	From record of El Paso gauging station, all surplus flow above 500 second-feet, from May 1st to June 15th	46 days.
1890.	Same condition, from April 17th to May 19th	33 "
1891.	Same condition, from April 12th to May 3rd	22 "
1892.	" " " from April 15th to May 7th	23 "
1893.	All surplus flow above 500 second-feet at El Paso gauging station, for irrigation season, would lack 11,000 acre-feet of filling reservoir.	
1897.	From record of El Paso gauging station, all surplus flow above 500 second-feet from April 13th to May 11th . .	29 "
1898.	Same condition, from April 17th to June 20th	65 "
1899.	During whole season only 6,500 acre-feet passed El Paso gauging station above the 500 second-feet.	

1076

XXVII.

That the evidence shows that cross sections of the Rio Grande were taken by a member of the boundary commission to the extent of three or four per mile for the entire distance from Rio Grande City to Brownsville, Texas, and that the two cross sections hereinbefore referred to were a fair indication of the contour of the Rio Grande between those points.

XXVIII.

In attempting to arrive at a conclusion in this case I have made some computations based partially upon known data and partially upon probabilities arising from the evidence. In such computation I have assumed the following conditions:

1. It appears by comparison of the tables of measurements at the gauging stations of San Marcial and El Paso that there is no material flattening or tailing out of the floods in the Rio Grande. If this remains true throughout the entire course of the river, a body of water passing El Paso would reach Rio Grande City, if at all, in practically the same form as to length and height as at El Paso, less losses between those points.

2. It seems probable from the conditions of the bed and banks of the stream, and the climate of the country through which it passes, that any flow of less than two thousand second-feet at El Paso, or 3,000 second-feet at San Marcial, can not possibly have any effect on the river at the head of navigation. It also seems probable that only such flows as are above this amount and are sustained for a considerable period, could reach the head of navigation in substantial quantities.

3. It seems probable that loss by seepage and evaporation will be as great between El Paso and Presidio del Norte as between San Marcial and El Paso, the loss may be greater owing to greater distance.

1077 4. From Presidio to Rio Grande City flood waters from El Paso would encounter in the bed the perennial waters known to exist there. To what extent they furnish a water table for these flood waters to travel upon is unknown, but I have assumed it in this computation that losses by seepage and evaporation are thereby lessened and have taken an arbitrary twenty per cent as representing the probable loss from such causes.

5. It seems probable that a flood passing El Paso would reach Rio Grande City, if at all, in from fifteen to 25 days, assuming the river to have comparatively a uniform fall between those points.

6. It appears from the evidence that a rise of two feet above low water between Rio Grande City and Brownsville is necessary to make navigation practicable, and these waters usually flowing down to that point, if at all, at a season when other supplies are low, I assume a rise of two feet to be necessary to be of any substantial benefit to navigation.

7. Assuming these conditions, I have prepared the following table:

Year	Duration of flood over 2,000 sec. ft. days at El Paso.	Acre-feet passing El Paso during time of flood.	Acre-feet passing Presidio del Norte, supposing 33 1/3% is lost.	If 20% is lost between Presidio and Rio Grande City, this would raise river at Rio Grande City the following amounts above low water for time flood was passing El Paso.	If 45% is lost between El Paso & Presidio del Norte and 20% between Presidio and Rio Grande City, this would raise river at Rio Grande City the following amounts above low water for time flood was passing El Paso.
1890.....	April 7 to July 3, 76 days.	733,570	489,050	2.0 ft. for 75 days...	1.6 ft. for 75 days.
1891.....	April 12 to July 4th, 94 days.	1,464,210	976,140	3.0 ft. for 94 days...	2.5 ft. for 94 days.
1892.....	April 15th to June 21, 68 days.	770,300	513,600	2.2 ft. for 68 days...	1.9 ft. for 68 days.
1893.....	April 29th to May 26th.	239,500	159,700	1.5 ft. for 32 days...	1.3 ft. for 32 days.
1894.....	No record, but as dry as 1893, and possibly drier.				
San Marcial 1895.	April 13th to June 30th, 72 days.	634,700 at San Marcial, 33 1/3% off 423,100 at El Paso.	252,100	1.2 ft. for 72 days...	0.9 ft. for 72 days.
San Marcial 1896.	April 13th to May 11th, 31 days.	236,200 at San Marcial, 33 1/3% off 157,500 at El Paso.	105,000	1.0 ft. for 30 days...	0.8 ft. for 30 days.
1897.....	April 21 to July 11th, 75 days.	983,200	655,500	2.6 ft. for 75 days...	2.1 ft. for 75 days.
1898.....	April 20th to May 11th, 24 days.	186,400	124,100	1.5 ft. for 24 days...	1.3 ft. for 24 days.
1899.....	No flood.				

1079 Assuming the loss from seepage and evaporation between El Paso and Presidio del Norte to be 45 per cent, instead of thirty-three and one-third (which would be at the same rate of loss per mile as is shown to occur between San Marcial and El Paso), the result, assuming all other conditions to be as hereinbefore stated, would be as shown in the last column of the foregoing table.

It will be observed that the above results show a contribution from floods passing El Paso to the navigable capacity at Rio Grande City to

the extent of a rise of two feet during four of the ten years mentioned, when $33\frac{1}{2}$ per cent is deducted for loss between El Paso and Presidio, and during three years out of the ten years, counting 1892, when 45 per cent is deducted between the same points. It is to be further observed that no account is taken in above computations for variations in the height of floods at El Paso, but the results simply show the average height a given amount of water passing El Paso, less deductions for probable loss, would raise the river at Rio Grande City for the same number of days it was passing El Paso. If these variations continue from El Paso to Rio Grande City, the beneficial effect on navigability would be lessened, owing to corresponding irregularity in the height of the rise at the latter point.

How reliable such results may be can not be determined from the evidence. Whether the loss is less or greater between the points named is unknown. There is some evidence in the case tending to disprove the correctness of such results. For example, the testimony of Daly to the effect that the 1897 flood only lasted eight or ten days at Presidio del Norte, and the testimony of Turpin that the same flood made no appreciable change in the river at Laredo, and the affidavit of Kelly to the effect that they have had no floods from the Upper Rio Grande in recent years. On the whole, I am unable to say to how much credit the result of such computations are entitled in arriving at the ultimate fact in question in this case.

1080

XXIX.

There is no direct testimony in this case showing that any given quantity of water in the Rio Grande passing El Paso reaches Rio Grande City, the head of navigation, and there accomplishes any certain effect upon the navigability of the stream.

XXX.

That the waters of the Rio Grande passing El Paso occasionally in seasons of high and protracted floods reach Rio Grande City, the head of navigation, in considerable quantities seems probable, but that they reach that point in quantities sufficient and in such form as to substantially add to the navigable capacity of the stream is not satisfactorily established by the evidence, nor can such a conclusion be satisfactorily deduced therefrom. I therefore find that the intended acts of the defendants in the construction of a dam or dams, or reservoir, and in appropriating the waters of the Rio Grande, will not substantially diminish the navigability of that stream within the limits of the present navigability.

1081 We have examined the record, which is very voluminous and shows that the whole matter was thoroughly gone into, and we conclude that the facts as set forth in the findings of the learned judge below are sustained by the evidence, and we adopt the same as the findings of this court.

The first seven assignments of error by appellant refer to the insufficiency or absence of evidence to support the findings. As above stated, we think that these findings are amply supported by the evidence and clearly within the preponderance of the same.

The eighth assignment of error is directed to the last finding of fact, which is the ultimate fact in the case. The court, in this finding of fact, found that the proposed acts of the defendants will not substantially diminish the navigable capacity of the Rio Grande within the present limits of navigability. It seems clear to this court that the appellant utterly failed to establish the fact that the proposed acts of the defendants would have the alleged effect upon the Rio Grande. While it may be true, as stated in the findings of fact by the trial judge, that the flood waters of the Rio Grande passing El Paso, Texas, do to some extent and under some circumstances add to the navigable capacity of the Rio Grande at Rio Grande City, the head of navigation, there is no evidence in this record from which a court can deduce what the effect may be, and consequently the appellant failed to establish its right to an injunction in this case. The burden of proof was upon the appellant. This was met by the appellant by showing that certain given quantities of water passed El Paso at certain periods specified, the natural presumption and result of which would be that it continued on down the course of the channel of the river. But this proof was met by the appellees by showing that the bed of the Rio Grande is of a porous character and capable of absorbing immense quantities of water; also, that immense quantities of water are lost by evaporation. This state of facts being made to appear, the appellant in this case was again compelled to assume the burden of showing that after these losses had taken place between El Paso

1082 and the head of navigation, there still remained a given quantity of water which would effect certain results at the point of navigability. In this the appellant failed. In fact, so far as disclosed by this record, such evidence is not in existence, there having been at the time of the trial of this case no gauging stations or other means adequate to measure the flow of the stream occasioned by waters passing El Paso.

The ninth assignment of error is not well founded. It must follow as a natural consequence upon a finding that the proposed acts of the defendants would not impair the navigable capacity of the Rio Grande that the bill should be dismissed. The only purpose of the bill in the present condition of the case was to enjoin such acts of the defendants only so far as they might effect that result.

The tenth assignment of error is general, and is directed to all of the findings of fact by the court below, and can not be sustained.

The eleventh, twelfth, and thirteenth assignments of error relate to the application for a rehearing of the case.

1083 The application for a rehearing is based upon two propositions:

(1st) The discovery of new evidence between the time of the final submission of the cause to the court and the entry of the decree; and (2d) an undertaking of the part of the Government to establish gauging stations along the Rio Grande below El Paso, for the purpose of accurately measuring the flow of that stream, so as to furnish reliable evidence not furnished upon the trial.

The first proposition is supported by the affidavit of one Frank P. Clark, a resident of the city of El Paso, State of Texas, the affiant stating that in the spring of 1881 he together with other persons constructed in the city of El Paso a large rowboat, twenty feet long and six feet wide; that they placed therein supplies for a prospecting trip, and that

Clark and his companions, three in number, embarked in said boat at or near the ferry across the said Rio Grande, between El Paso and Paso del Norte, Mexico, now called Juarez; that the Rio Grande was not then at high flood stage, but was flowing a good volume of water, ample for their purposes; that they made very quick time and at the close of the fifth day, May 9th, 1881, the party passed the mouth of the Conchos River; that the boat came the whole journey safely, having at all times on the way an ample supply of water, and that in the last stages the volume of water in the stream appeared to be even larger or deeper than when they left El Paso, Texas. No evidence or proposed evidence is submitted as to the flow of the river at El Paso subsequent to the departure of this party down the stream, whether the same remained stationary in height as it was upon their departure; whether there was a pronounced rise or fall therein. Consequently this proof if submitted could have no effect on the judgment in this case.

As to the second proposition submitted in support of the application for a rehearing, it is a proposal not to produce evidence which already exists, but to create evidence not existing at the time of the trial or of the application. We think no sufficient diligence has
1084 been shown by the Government in this case in regard to this evidence. From the time of the issuing of the mandate by the Supreme Court of the United States remanding this cause for this investigation the Government took no steps whatever to furnish this evidence. It is not shown in the application why no such steps had been taken. Even during the trial of this case it must have been as much apparent to counsel for the Government that this testimony was required to support the bill as it was after the findings of fact came from the trial judge. No mention of the same was made nor any application presented to the court at that time. Again, it is not shown by this application that the result of any such proposed investigation will change the conclusion reached in this case. The Government simply asks that this case be reopened for the purpose of permitting it to make an experiment which it should have made before that time, and the result of which no one undertakes to foretell. It is true that the question of fact involved is one of difficulty, and satisfactory evidence can be obtained only after extensive experiment; but the Government has seen fit to try the case without taking any precautions in this regard, and must be held to the consequences of its neglect. We know of no rule, taking into account even the great public importance of this case, which would authorize this court or the court below to reopen the case under such circumstances. See *Rogers vs. Marshall*, 3 Fed., 59; *Munson vs. Mayor*, 11 Fed., 72; *Bunos vs. Ween*, 26 Atl., 890; *Brack. Mod. Eg. Prac.*, 837; *Pittsburg, etc., Co. vs. Cowles, etc., Co.*, 64 Fed., 125. *Burrows vs. Ween*, *supra*, was a case tried by the chancellor, as this was, and a similar application was made and denied.

The fourteenth and last assignment of error relates to the refusal of the court to make findings of fact as to the effect upon the navigability of the Rio Grande at the point of present navigability of the diversion from the stream of waters for irrigation purposes in the State of Colorado and to the refusal of the court to find the ultimate fact in this case in favor of the Government.

1085 We do not find in this record any sufficient evidence upon which to base a satisfactory finding as to the effect of the diversion of water from the stream in Colorado upon the navigability of the stream at Rio Grande City, and we think the refusal of the trial court to make those findings was correct. The refusal of the court to find the ultimate fact in this case in favor of the Government is, as we have before stated, in full accord with our view of the testimony in this case, and was therefore correct. We find no error in the record and the decree of the lower court will be affirmed.

And it is so ordered.

WILLIAM J. MILLS,
Chief Justice, &c.

We concur:

JOHN R. MCFIE, A. J.
J. W. CRUMPACKER, A. J.
A. J.

Parker, J., having tried the case below, did not participate in this decision. Leland, Judge, absent.

1086 TERRITORY OF NEW MEXICO,
Supreme Court, ss:

I, José D. Sena, clerk of the supreme court of the Territory of New Mexico, do hereby certify that the foregoing 1,085 pages contain a full, true, complete, and perfect transcript of the record and proceedings, pleadings, and opinion filed in the above entitled cause, which is transmitted to the Supreme Court of the United States in accordance with an appeal herein granted on the 14th day of November, A. D. 1900.

Witness my hand and the seal of the supreme court of the Territory of New Mexico, this 28th day of December, A. D., 1900.

[SEAL.]

JOSÉ D. SENA,
Clerk, Supreme Court, Territory of New Mexico.

1087 *The United States of America to the Rio Grande Dam & Irrigation Company et al., greeting:*

You are hereby cited and admonished to be and appear at a term of the Supreme Court of the United States, now being held at Washington, within sixty days from the date of this citation, pursuant to an appeal taken from the supreme court of the Territory of New Mexico, wherein the United States of America was appellant and you were appellees, to show cause, if any there be, why the judgment rendered against the said appellant, as the said appeal mentioned, should not be corrected, and why speedy justice should not be done in that behalf.

Witness, the Honorable Melville W. Fuller, Chief Justice of the Supreme Court of the United States, this 28th day of December, A. D. 1900.

[SEAL.]

WILLIAM J. MILLS,
Chief Justice of the Supreme Court, Territory of New Mexico.

On this day of , in the year of our Lord one thousand
 nine hundred and , personally appeared before me the
 subscriber and makes oath that he delivered a true copy of
 the within citation to .

Service of notice of the above citation upon the defendant named
 therein is hereby acknowledged on this the 8th day of February, 1901.

W. A. HAWKINS and

A. B. FALL,

S. B. NEWCOMB,

By W. A. HAWKINS,

Attys. for Deft.

1088 (Indorsement:) File No. 18033. Supreme Court U. S., Octo-
 ber term, 1900. Term No. 548. The United States, appt., vs. The
 Rio Grande Dam & Irrigation Co. Citation & proof of service. Filed
 Feb. 16, 1901.

(Indorsement on cover:) File No. 18033. New Mexico Territory,
 supreme court. Term No. 239. The United States, appellant, vs. The
 Rio Grande Dam and Irrigation Company et al. Filed January 24th,
 1901.

ADDITIONAL TO THE REPORT

SUPREME COURT OF THE UNITED STATES

October Term, 1901

No. 235

UNITED STATES, APPELLANT,

THE RIO GRANDE DAM AND IRRIGATION COMPANY
ET AL,

APPEAL FROM THE SUPREME COURT OF THE TERRITORY OF NEW
MEXICO.

SUPREME COURT OF THE UNITED STATES.

OCTOBER TERM, 1901.

No. 239.

UNITED STATES, APPELLANT,

v.

THE RIO GRANDE DAM AND IRRIGATION COMPANY
ET AL.

APPEAL FROM THE SUPREME COURT OF THE TERRITORY OF NEW
MEXICO.

STIPULATION.

It is hereby stipulated by counsel for the respective parties hereto, that the matter hereto attached, embracing a report by W. W. Follett, civil engineer, entitled "A Study of the Use of Water for Irrigation on the Rio Grande del Norte," together with a table appended thereto, nine hydrographs prepared by Phillip E. Harroun, civil engineer, and certain tables with a summary thereof in connection with said hydrographs, also prepared by said Harroun, shall be added to the transcript of the record herein as an appendix.

MARSDEN C. BURCH,
Of Counsel for the United States.

J. H. MCGOWAN,
Of Counsel for Appellee.

CORRESPONDENCE TOUCHING AND THE PROCEEDINGS OF
THE INTERNATIONAL COMMISSION ON THE SUBJECT
OF THE EQUITABLE DISTRIBUTION OF THE
WATERS OF THE RIO GRANDE.

DEPARTMENT OF STATE,
Washington, May 13, 1896.

Col. ANSON MILLS, U. S. A.,
Commissioner, etc., El Paso, Tex.

SIR: I transmit herewith copies of instruments in English and Spanish, one signed by Mr. Romero, the Mexican minister at this capital, on behalf of Mexico, and one by myself, on behalf of the United States, empowering Mr. Osorno, the chief of the Mexican commission, and yourself to examine and report upon certain questions involving the equitable distribution and use of the Rio Grande between the two Republics.¹

I understand that Mr. Romero has brought to the notice of Mr. Osorno the texts of this instrument, with a view to its prompt fulfillment. I shall, however, out of abundant caution, and following the suggestion in my note to Mr. Romero, inclose a copy of both texts to Mr. Osorno for his full and complete information.

It is the desire of both Governments that the subjects mentioned in the commissions herewith be prosecuted without unnecessary delay to a completion within the stipulated period of eight months from May 6, 1896. The concluding part of these commissions contemplates that you and your colleague, in case of agreement as to results, "shall make a joint report to each Government, and if they disagree, and so far as they disagree, shall make separate reports to each."

Commending the subject to your careful and earnest consideration, and enjoining prompt and energetic action, I am, sir, your obedient servant,

RICHARD OLNEY.

EL PASO, TEX., *November 25, 1896.*

Hon. SECRETARY OF STATE,
Washington, D. C.

SIR: I have the honor to submit herewith the report of the joint commission on the investigations into the distribution of the waters of the Rio Grande and the construction of a dam and reservoir near El Paso, Tex., with the following inclosures:

1. Letter of Mr. E. P. Ripley, president of the Atchison, Topeka

¹ For copy of protocol see p. 1 of Journal of August 17, 1896.

and Santa Fe Railway Company, submitting a proposition to remove his roadbed from the proposed reservoir.

2. Letter of Mr. J. Kruttschnitt, general manager of the Southern Pacific Railway Company, making a similar proposition with reference to his roadbed.

3. Letter from Messrs. Magoffin, Zimpelman & Crosby, and a separate letter from Mr. Magoffin, naming a price upon about 7,000 acres of land to be submerged.

4. Joint report of the engineers of the respective countries regarding the technical investigations on the subject, with accompanying appendixes and maps.

In explanation of the large excess of the present estimates, compared with that of the preliminary investigations made in 1889, I beg to make the following remarks:

First. President Ripley has increased Mr. Follett's estimate about \$98,000 for the removal of the Santa Fe road. Mr. Ripley, however, claims \$48,000 as compensation for increased maintenance by the increase of the number of bridges, etc., over the many ravines.

I am satisfied, however, and I believe that Mr. Ripley will be so satisfied, that the maintenance of these trestles will be no greater from year to year than the present cost of riprapping against the encroachments of the river and ballasting in the soft bottom lands. I am of the opinion that on further examination Mr. Ripley will be willing to remove his road at Mr. Follett's estimate. However, I have thought best to place his figures in the estimates to insure a sufficiency of funds.

Second. Mr. J. Kruttschnitt's (general manager of the Southern Pacific Railway Company) estimates are more difficult of explanation, because he has given no items and has made a large increase over Mr. Follett's estimates. However, there is no doubt but the principal increase is due to a necessary new bridge. When Mr. Follett made his estimate there was an old wooden bridge, about worn out, which the road was contemplating moving, and has since replaced by an iron and stone structure at large cost. This will have to be torn down and a new one built of larger dimensions, some 22 feet higher, and while Mr. Kruttschnitt does not state so, I think he has made an estimate for a very expensive bridge, for otherwise I think the road could be moved for something very near Mr. Follett's estimate. However, I have thought best in this case also to place the amount at Mr. Kruttschnitt's figures.

Third. The increase in the estimate for the condemning of the land is partly accounted for by the fact that the limekiln, which was estimated by Mr. Follett at \$1,000, has since become a very valuable plant, supplying the Kansas City smelter at this place. There are many valuable buildings and works, which probably cost about \$30,000 or \$40,000, all of which will probably have to be submerged, and then farther above there is a brick factory which cost several thousand dollars. The land itself (about 27,000 acres) is not worth over \$3 or \$4 an acre in the public market, and the title to about 10,000 acres to be submerged in New Mexico is on unconfirmed grants, the title probably still resting in the United States, in which case it would cost nothing; but in this case also I have thought best to estimate that it would have to be bought and paid for, and that in the course of condemnation the owners would get larger prices for their land than it is actually worth.

Fourth. Regarding the dam proper, it is the most disappointing

feature in the whole investigation, for the reason that the bed rock was found so much farther below the surface than was anticipated, entailing extraordinary expense. The depth ranges from 44 to 87 feet across the gorge, 500 feet wide, filled with sand and gravel through which the water readily percolates, and it is not at all probable that open cofferdams could be sunk to that depth, as the pressure would be from two to three atmospheres, at the bottom about 40 pounds to the square inch, which would force the water and fine sand through underneath faster than it would be practicable to pump it out; hence it will be necessary to hold the water and sand back by pneumatic pressure in closed cofferdams or caissons, or some other similar method, which is the principal cause of the great increase in expense of the dam over the former estimate. Of course the increased depth of the bed rock increased the total height of the dam, largely increasing the number of cubic yards of masonry. Mr. Follett estimated 47,000 cubic yards; this estimate calls for 93,000 cubic yards. Mr. Follett's estimated cost was \$4.50 per yard; the present engineers have just about doubled it. This increase in the expense of the masonry is understood to provide for the expense of the caissons and cofferdams, and is about \$400,000, which ought to be amply sufficient. I think some of the engineers' estimates are excessive, but taking it all in all, I do not believe the estimate as a whole to be so.

I consider the description (on page 5 of the engineers' joint report) of the land proposed to be ceded to Mexico as too indefinite and uncertain to be incorporated in a treaty, for the reason that it takes as its initial point the "middle" of a very small railroad bridge across a ravine, which bridge is to be removed and the locality submerged by the waters of the reservoir, and makes no specific connection with the international boundary. I would suggest as a better description the following: Beginning at a point where the parallel of $31^{\circ} 47'$ intersects the middle of the deepest channel of the Rio Grande; thence west through the initial monument, No. 1, of the international boundary line between the United States and Mexico, and along said parallel (the boundary) about 1,312 feet; thence due north along the meridian to its intersection with the deepest channel of the Rio Grande; thence down said deepest channel of the Rio Grande with its meanders to the place of beginning, containing about 100 acres.

This estimate is a very large sum, indeed, and I doubt very much whether Mexico has been injured by the United States in depriving them of their vested rights in the water to that extent; but it is such a problematical question that it will be utterly impossible to ever arrive at any degree of accuracy as to how much they have been injured. It is certain, however, that they have been wronged pecuniarily to a very large extent, and the future will continue to entail more in a progressive ratio until the matter is settled.

My first impulse was to insist that Mexico should share a portion of the pecuniary burden; but, in the first place, the Mexican commissioner would not agree to this, which would compel separate reports, and, in the second place, if Mexico did share in the expense she would expect to share in the control of the construction, and as a double administration between any different people would invariably prolong the work and increase the cost, it is particularly so in this case, where the methods of the two peoples are so different. I think, therefore, even if Mexico were willing to share to the extent of \$400,000 or \$500,000, under a joint construction, it would be economical for the United States to take it alone and bear all the burden.

With a wide-awake and practical American engineer, this dam should be completed within a period of two years at the cost named. With a joint administration with Mexico, I dare say both time and cost would be much increased. I felt, therefore, constrained to join Mr. Osorno in the report I have submitted above.

Very respectfully, your obedient servant,

ANSON MILLS,
Colonel Third Cavalry, U. S. A., Commissioner.

JOURNAL.

EL PASO, TEX., August 17, 1896.

In this city at the county court-house of El Paso County, Tex., Col. Anson Mills and Señor Don F. Javier Osorno, the first named commissioner on the part of the United States, and the second commissioner on the part of Mexico, met in compliance with the requirements of the following agreement between their two Governments, dated Washington, May 6, 1896:

"It being essential to the conduct of the negotiations contemplated by the concurrent resolution of Congress of April 29, 1890, that there should be a definite and authoritative ascertainment of the facts relating to the irrigation of the arid lands in the valley of the Rio Grande River, to the construction of a dam across said river at El Paso, Tex., and to the other subjects-matter of said resolution;

"And the Mexican Government, deeming that it is of vital interest for the Republic and especially for the inhabitants of the right bank of the Rio Bravo (Grande) to contribute for their part to preparing the means for carrying out the negotiations recommended in the aforesaid resolution of the Congress of the United States of America:

"Col. Anson Mills and Señor Don F. Javier Osorno, members of the International Boundary Commission, organized under the convention of March 1, 1889, are hereby requested and directed to investigate and report, as soon as practicable, upon the questions and matters following, to wit:

"1. The amount of water of the Rio Grande taken by the irrigation canals constructed in the United States of America.

"2. The average amount of water in said river, year by year, before the construction of said irrigation canals and since said construction—the present year included.

"3. The best and most feasible mode, whether through a dam to be constructed across the Rio Grande near El Paso, Tex., or otherwise, of so regulating the use of the waters of said river as to secure to each country concerned and to its inhabitants their legal and equitable rights and interests in said waters.

"It is understood that the said Anson Mills and the said Señor Don F. Javier Osorno will also be requested and directed to perform the duties hereinbefore described on behalf of the Governments of the United States and Mexico; that each Government shall be at liberty to aid and facilitate the work to be accomplished by the employment of such engineers, clerks, and other agents as it may see fit; that the said Col. Anson Mills and the said Señor Don F. Javier Osorno, if they agree upon results, shall make a joint report to each Government; and if they disagree, and so far as they disagree, shall make separate reports to each; and that eight months from this date.

"Washington, May 6, 1896.

"RICHARD OLNEY.
"M. ROMERO."

The two commissioners, after exchanging their respective credentials, which were found in good and due form, announced the following as the members of the commissions on the part of the two Governments:

On behalf of the United States: Col. Anson Mills, commissioner; Capt. George McC. Derby, engineer in charge; Mr. John A. Happer, secretary; Mr. W. W. Follett, assistant engineer; and on behalf of Mexico: Señor Don F. Javier Osorno, commissioner; Señor Don J. Ramon de Ibarrola, engineer in charge; Señor Don S. F. Maillfert, secretary; Señor Don Alberto Flores, assistant engineer—who solemnly declared the commission inaugurated and pledged themselves to faithfully and efficiently fulfill their respective duties.

By reason of the short time left to the commission of the time originally allotted

for this work, and as all the members of the commission understand English, it was then agreed, first, that the records shall be kept in the English language only, one record by each commission, which shall be duly signed by each commissioner and attested by their secretaries; second, that the engineer's reports, either joint or separate, shall be handed to the commissioners on or before December 6, 1896, in order that the commissioners may have them and use them in framing their report to their respective Governments before January 6, 1897.

The work before the commission was then distributed as follows: The commissioners to take up and as far as practicable complete—

1. Acquire options from the owners for as much of the 27,000 acres of land proposed to be submerged as possible.
2. By correspondence, try to secure from the Southern Pacific and Atchison, Topeka and Santa Fe railway companies propositions to move their roads out of the bed of the proposed reservoir for a stipulated sum from the Government.
3. By correspondence, through the State Department, to endeavor to get from the State of Texas a cession of jurisdiction to the Federal authorities over that portion of the lands to be submerged that lie in Texas in order that the process of condemnation may be simplified by all going through the same courts—the Federal.
4. By correspondence, through the State Department, to endeavor to restrain, either by present or future laws to be enacted by Congress, the people of New Mexico from building the numerous dams and reservoirs that have been projected by the Geological Survey in that Territory in the bed of the Rio Grande and its tributaries. This restraint to be only so far as the appropriation of waters by these proposed dams and reservoirs might interfere with the present vested rights in Mexico and Texas below the proposed dam.
5. By correspondence, through the State Department, to endeavor to get a cession of about 100 acres of land from the United States to Mexico, in case the dam should be constructed as now proposed, so that one end of it should be located on Mexican soil.

The engineers to take up, and as far as practicable, complete the following:

1. Locate the site for the proposed dam.
2. Develop thoroughly the bed rock.
3. Make one or more working plans, with estimates of cost in detail for the dam itself and all appurtenances, such as by-wash and outlets.
4. Survey and make an accurate map of whatever land may be necessary to cede to Mexico, in order that Mexico may possess one end of the dam on her own territory.
5. Make thoroughly all investigations practicable, as to flow of the waters at different points on the Rio Grande and its tributaries, as contemplated in the agreement between the Governments.
6. Enumerate and measure all the ditches and reservoirs that are now taken from the Rio Grande and its tributaries and measurement of flow, as far as practicable, and determine theoretically as far as possible the question whether or not, after these ditches and reservoirs are supplied, the present flow of the river will maintain the proposed reservoir year by year.

After long and informal discussion between the engineers, they proposed the following plan of operations, which was adopted: The Mexican commission taking the larger part of the work, by reason of the fact that the United States has already done a very considerable amount of preliminary work, and the further fact, the funds now available for the United States commission are limited.

Mr. W. W. Follett, assistant engineer on the part of the United States, who knows thoroughly the Rio Grande and its tributaries, to go to Denver and the valley of the Rio Grande, accompanied by one of Mr. de Ibarrola's assistants, to collect such information as is possible relative to the amount of water taken from the Rio Grande: the storage reservoirs existing and proposed, and the flow of the river.

The Mexican engineers to at once make a careful topographical survey of the gorge from the railroad bridge to a point where it widens out into the valley, and where the dam is proposed to be constructed.

2. To have a series of borings of such necessary depth to which it will be practicable to construct the dam.

3. To then make a thorough investigation of all localities where hard bottom is found, sinking a sufficient number of well holes and trial pits to determine fully the character of the foundation available, so as to furnish data for the preparation of plans and specifications for the dam, the United States engineer to be present at the sinking of the well holes and pits, when practicable.

4. To take such additional observations as may be practicable as to the silt-carrying capacity of the river, should there be any flow of the river up to November.

5. Such engineering work as is not hereinbefore specifically delegated to either commission may be done jointly or separately, as the engineers themselves may agree upon, but all engineering work must be completed, in so far as is practicable with the funds now on hand, and report submitted to the joint commission on or before December 6, 1896.

ANSON MILLS,
JOHN A. HAPPER,
F. JAVIER OSORNO,
S. F. MAILLEFERT.

EL PASO, TEX., September 8, 1896.

The Joint Commission on the investigation of the proposed international dam and distribution of the waters of the Rio Grande met at 4 p. m. at the office of the United States commission, the earliest opportunity practicable, owing to the illness of the United States commissioner since the 17th of August.

The Joint Commission then proceeded to indite the following letters of inquiry to the respective presidents of the Atchison, Topeka and Santa Fe and Southern Pacific Railway companies:

EL PASO, TEX., September 8, 1896.

To the president of the Atchison, Topeka and Santa Fe Railway Company.
(Through Mr. Copeland, agent, El Paso, Tex.)

DEAR SIR: The undersigned, Anson Mills, commissioner for the United States, and F. Javier Osorno, commissioner for Mexico, duly authorized and appointed by their respective Governments to acquire information and formulate a treaty for presentation to Congress, through the State Departments of each country, for the building of an international dam and reservoir at this place, as per the inclosed copy of an agreement between Mr. Olney, Secretary of State for the United States, and Mr. Romero, minister for Mexico, have found as one of the things necessary the ascertainment of the cost of the removal of your road from the bed of the proposed reservoir. We inclose you herewith the printed report of Colonel Mills and the railroad engineer, Mr. Follett, containing a preliminary survey of the present Santa Fe road bed and the proposed location for its removal.

Mr. Follett, in this survey, made estimates of the cost of removal as will be observed, but it is fair to say that this was only preliminary and probably largely in excess of the actual cost of removal at this time, the survey having been made seven years since.

We want to ask you to make a proposition to us for a stated sum for removing your road without the bed of the lake, this proposition to be received by us prior to December 1, 1896.

We are compelled to ask for this estimate thus hastily for two reasons, first, because the time allotted to us for our report to the Governments is not now sufficient for our commission or the railroad company to make a detailed survey and estimate, and second, because if we had time to make such a survey ourselves, it is not probable that the location we should select would be as satisfactory as one selected by the road itself.

We have here belonging to Mr. Follett's printed report his complete field notes and profiles, and we suggest that, if practicable, you send an engineer of your own selection to take up his work at any point on its line and resurvey it for such distance as might be necessary in your opinion to establish the correctness of his work and estimates, and from that make your proposition to remove the road. Mr. Follett can be found here working on the dam and other investigations necessary for its construction.

Your vice-president, Mr. Morton, some time since asked for information regarding this matter, and we furnished through Mr. Copeland a partial statement of what is made hereinbefore, and he may be able to furnish you information that you may desire that we do not now comprehend.

Mr. Mead, resident engineer, Atchison, Topeka and Santa Fe Railroad at Pueblo, Colo., has also been here, and obtained from Mr. Follett the general plan of the proposed change.

Please address your reply to No. 2 Dupont Circle, Washington, D. C.

Very respectfully, yours,

ANSON MILLS,
United States Commissioner,
F. JAVIER OSORNO,
Mexican Commissioner.

EL PASO, TEX., September 8, 1896.

To the President of the Southern Pacific Railway Company.

(Through Mr. Martin, superintendent, El Paso, Tex.)

DEAR SIR: The undersigned, Anson Mills, commissioner for the United States, and F. Javier Osorno, commissioner for Mexico, duly authorized and appointed by their respective Governments to acquire information and formulate a treaty for presentation to Congress, through the State departments of each country, for the building of an international dam and reservoir at this place, as per the inclosed copy of an agreement between Mr. Olney, Secretary of State for the United States, and Mr. Romero, minister for Mexico, have found as one of the things necessary the ascertainment of the cost of the removal of your road from the bed of the proposed reservoir. We inclose you herewith the printed report of Colonel Mills and the railroad engineer, Mr. Follett, containing a preliminary survey of the present Southern Pacific roadbed and the proposed location for its removal.

Mr. Follett in this survey made estimates of the cost of removal, as will be observed, but it is fair to say that this was only preliminary and probably largely in excess of the actual cost of removal at this time, the survey having been made seven years since.

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Please address your reply to No. 2 Dupont circle, Washington, D. C.

Very respectfully, yours,

ANSON MILLS,
United States Commissioner,
F. JAVIER OSORNO,
Mexican Commissioner.

The United States commissioner then stated that he agreed and approved of the action of the Mexican commissioner in his (the Mexican commissioner's) approval of the programme of the engineers of both commissions, made during the illness of the United States commissioner.

The joint commission then adjourned, to meet as soon as the secretaries shall have obtained the necessary information regarding the lands proposed to be submerged, to aid in getting options thereon.

ANSON MILLS,
JOHN A. HAPPER,
F. JAVIER OSORNO,
S. F. MAILLEFERT.

EL PASO, TEX., November 25, 1896.

The engineers having signified their willingness to submit their joint report, as required in the joint journal of August 17, on the distribution of the waters of the Rio Grande (Bravo) and the proposed international dam above El Paso, Tex., the joint commission met at 10 a. m. at the office of the United States commissioner for the purpose of receiving their report thereon and the final consideration of the questions submitted to the joint commission in the agreement between the Secretary of State for the United States and the Mexican minister at Washington, dated May 6, 1896.

The engineers for each Government then presented to the joint commission a joint report duly signed by each, which is appended hereto and described as follows:

First. The joint report of the two engineers of this date.

Second. The subreport of Civil Engineer W. W. Follett on the part of the United States.

Third. Topographical map of the river and lands adjacent at the point selected for the international dam, and showing boundaries of land proposed to be ceded to Mexico.¹

Fourth. Sketch showing borings taken in the bed of the Rio Grande above El Paso.

The commissioners, after due investigation and consideration of the reports and maps described, proceeded to determine the three questions submitted to them in the agreement between the two Governments, the first of which reads as follows:

"The amount of water of the Rio Grande taken by irrigation canals constructed in the United States of America."

From the very elaborate statistical report of Civil Engineer Follett the commission find that prior to 1880 there were in Colorado 511 canals taken from the Rio Grande and its tributaries, irrigating about 121,000 acres of land; that this number of canals and amount of land irrigated has kept increasing year by year, many of the canals being enlarged during the same period, so that the number of canals at this date has increased to 925, irrigating 318,000 acres of land; and that in New Mexico there were, prior to 1880, 563 canals taken from the Rio Grande and its tributaries, irrigating 183,000 acres of land, and at the present time there are 603 canals, irrigating 186,000 acres of land.

These results show an aggregate of 1,074 canals taken out in Colorado and New Mexico prior to 1880, and 1,528 taken from the river and its tributaries at this date, showing an increase of 454 canals and of 195,000 acres irrigated in the State of Colorado and Territory of New Mexico. This shows quite accurately the increase for the past sixteen years. There are no reliable records available showing the increase in the preceding years, but they were doubtless on a more rapidly increasing ratio.

It will also be observed that the greatest increase during these sixteen years was in the State of Colorado, the number of canals and acres irrigated remaining almost stationary in New Mexico for that period, but this is easily accounted for by the fact that the appropriation of water in Colorado has rendered such a scarcity in New Mexico that little further increase of canals and acreage was profitable.

It is evident to the commissioners that as the flow of water in the Rio Grande had not only become scarce at El Paso, but high up in New Mexico prior to 1888 or 1889, any increase of water used in Colorado would diminish materially the flow at El Paso during the irrigation season.

The foregoing seems to the commissioners to be as intelligent an answer as practicable to the first section of the agreement submitted to them, above referred to.

The commissioners then took up the second section of the above-mentioned agreement, which reads as follows:

"The average amount of water in said river year by year before the construction of said irrigation canals and since said construction, the present year included."

There are no records or testimony available which will enable the commissioners to determine this question entire, with any degree of accuracy. The first record of the flow of the river here at El Paso was taken in 1889, the driest year up to that date, the river being dry as far above as Albuquerque, N. Mex., and no water passing El Paso for four months during the year, embracing August, September, October, and November. There is no tradition of such scarcity of water prior to this date—1889—the river only being dry once in about seven years, and then only for a short period in the latter part of the summer.

For the eleven months prior to March 31, 1890, the flow of the river at El Paso was 425,000 acre-feet; this includes the long drought of 1889 before mentioned. For the year ending March 31, 1891, the flow was 1,100,000 acre-feet. For the year 1892 the flow at El Paso was 1,850,000 acre-feet. For the year 1893 the flow was 875,000 acre-feet.

During a part of this time measurements at Embudo in the Rio Grande near the Colorado line showed that the flow at that point was greater than at El Paso, there being no increase in the flow from Embudo to El Paso. This fact is mentioned to show that the supply of water both in New Mexico and in the valley of El Paso depends for the greater part upon that of its head waters in Colorado.

An examination of the old canals in use in the El Paso Valley some thirty years ago convince us that those on the Mexican side had a capacity of about 300 second-feet and that those on the United States side had a capacity of about 250 second-feet.

Many of these for the past five years have been constantly dry, and all of them

¹ Printed copies reduced one-half.

have been dry for a great part of the irrigating season three years out of the five past.

The foregoing is a condensed compendium of the large mass of information and statistics taken by our engineers, from which we form the following conclusions:

That the flow of the river at El Paso has now been decreased by the taking of water for irrigation by canals constructed in the United States of America, about 1,000 second-feet for one hundred days annually, equal to 200,000 acre-feet of water.

It will be observed that this loss is distributed through the summer flow, which at best was not always sufficient before the diminution took place during dry seasons.

It should be understood that the great mass of these waters both before the construction of the canals and since consists of flood waters carried down the river unused, being utterly unavailable without large reservoirs to hold it for the season of irrigation, the maximum flow lasting but a few days, running as high as 16,000 second-feet, generally before the irrigation season fully sets in, and an average flood of about 5,000 second-feet during about forty or fifty days in April and May.

The commission then proceeded to the consideration of the third section of the agreement before referred to, which reads as follows:

"The best and most feasible mode—whether through a dam to be constructed across the Rio Grande near El Paso, Tex., or otherwise—of so regulating the use of the waters of said river as to secure to each country concerned and to its inhabitants their legal and equitable rights and interests in said waters."

The joint report of the engineers develops a feasible method of building a dam across the Rio Grande near El Paso (about 3 miles above) and impounding a large mass of the flood waters in a lake some 15 miles long by about $3\frac{1}{2}$ miles wide, which it is believed by the commission will so regulate the use of the waters of said river as to secure to each country concerned and to its inhabitants their legal and equitable rights and interests in said waters, and neither they nor the commissioners have been able to discover any other feasible mode of consummating these ends.

The joint commission is of the opinion that the present flow of the river is sufficient to maintain the reservoir as projected, but insufficient to maintain it and at the same time maintain the projected reservoir 120 miles above El Paso, in New Mexico, known as the Elephant Buttes dam and reservoir. One of these projects, in the opinion of the commission, must give way to the other, or at least, if both are built, that at Elephant Buttes must in some way be restrained from using water already appropriated by the citizens of the El Paso Valley, both Mexicans and Americans; and a method provided in case they violate these restraining rules for a prompt and efficient legal remedy for the parties injured.

The investigations for the bed rock on which to found a masonry dam have been difficult and prolonged, but at last a suitable site has been discovered by Señor Don J. Ramon de Ibarrola, chief of the special section for Mexico, who conducted these and the topographical investigations. The depth of the rock is at such a distance from the surface—the deepest place being about 90 feet—that it will entail much greater cost in the construction than was anticipated by the preliminary examination that had been heretofore made. However, its construction is perfectly feasible and only a question of cost.

At this point both banks of the river are in United States territory, but a very short distance from the boundary line between New Mexico and Mexico, and it is proposed if the dam be constructed that a cession of some 98 acres be made by the United States to Mexico, the metes and bounds of which are fully described in the engineer's report, so that Mexico may own one end and half of the dam and have access to the lake, for the very obvious purpose of conducting its share of the waters impounded through its own territory to its own lands to be irrigated. This land is practically worthless to the United States, being steep mountain sides of almost solid rock; but this cession should be made in such a manner as to effectually guard the rights of the Southern Pacific Railway Company as an American corporation.

It is no part of the purpose of this project to construct canals from the dam on either side; the water to be delivered to the local authorities of each nation through outlets in the dam proper.

It is the opinion of the Joint Commission that Mexico has been wrongfully deprived for many years of a portion of her equitable rights in the flow of one-half of the waters of the Rio Grande at the time of the treaty of Guadalupe Hidalgo; and if there were no other evidence of that fact than the records and measurements above referred to, it is apparent to the eye of any visitor to the

locality, where can be witnessed the dying fruit trees and vines, the abandoned fields and dry canals for the greatest portion that has heretofore been cultivated; and while we are considering the equitable rights of Mexico, this is also true of the United States side, where almost the same abandonment and destruction of former prosperous farms may be witnessed.

The joint commission is of the opinion that the inapounding of this large body of the flood waters of the Rio Grande would not only effectually remedy the existing troubles regarding the equitable division of the waters of said river between the two countries, but would make it feasible to control the flow in the river so that it will be practically constant and uniform and prevent the erosions and avulsions which have heretofore rendered the boundary line between the two countries so uncertain, unstable, and vexatious. It is certain that this effect will result as far down the river as the mouth of the next important tributary, the Concho River, of Mexico, and that the restraint of the torrential flow will, in a great degree, remedy the erosions and avulsions below the mouth of the Concho to the Gulf.

Of the 27,000 acres to be submerged by the waters of the reservoir, about 10,000 are in the Territory of New Mexico and consist of two unconfirmed grants, known as the Francisco Garcia and Refugio Colony grants. It is probable that the title to most of this land still rests in the Government of the United States, about 1,000 acres at the upper end of the Refugio Colony grant being occupied by settlers, and that there will be no difficulty in proceeding at once to submerge the remainder.

The remaining 17,000 acres are in the State of Texas, and it is probable that in many cases there will be efforts to procure, by injunction and otherwise, large and exorbitant sums of money for these lands, unless there can be devised a process of condemnation that will insure justice to the United States. Probably the State of Texas would be willing to cede jurisdiction of these lands to the United States and thus enable the same courts to have jurisdiction over the entire body of land to be submerged.

This may be important from the fact that the changing of the channel of the Rio Grande in these lands has brought about questions of boundary between Texas and New Mexico, which may embarrass the adjustment of titles when different courts have jurisdiction.

The commissioners made earnest efforts to procure from some of the large holders of the lands to be submerged, an offer of their lands at a reasonable valuation, hoping thereby to encourage a willingness on the part of all to permit the acquisition of title at a reasonable valuation. The only result so far has been the inclosed letter from Messrs. Magoffin, Zimbleman, and Crosby, and a separate letter from Mr. Magoffin offering some 7,000 acres, consisting of the best land to be submerged, in which the price asked, \$8 per acre, the commissioners consider to be about twice the market value. The commissioners would recommend that no further efforts be made to procure the lands to be submerged by purchase, but that the usual course of condemnation be resorted to in case the lands are required.

There are no considerable vested water rights on the river below the El Paso Valley and above the Concho, where the flow below is always constant and abundant.

The estimate of the cost of this entire project is as follows:

For the construction of the dam proper, waste ways, outlets, etc. (see the estimates of the joint engineers, appended hereto)	\$1,117,000.00
For the removal of the tracks of the Atchison, Topeka and Santa Fe Railway Company (see copy letter of President E. P. Ripley, inclosed, marked X)	522,728.36
For the removal of the tracks of the Southern Pacific Railway Company (see copy letter of General Manager J. Kruttschnitt, inclosed, marked Y)	447,385.00
For the condemnation of the lands to be submerged, and improve- ments thereon	190,000.00
For salaries, office expenses, etc.	40,000.00
Total	2,317,113.36

Notwithstanding the magnitude of this sum, taking into consideration the impossibility of ever arriving with any degree of accuracy to the damage that has been done Mexico by the depletion of the waters by the United States, and that any settlement by a pecuniary compensation would give little satisfaction, for the reason that by the time the sums due the parties were arrived at it will, in all

probability, have been so dissipated by the intervention of lawyers, claim agents, and others that the true sufferers would be little compensated, and the further fact that it is believed that there is a moral obligation resting on the two Governments—and it is reasonably practicable—to rescue the perishing communities here from the heretofore unwitting spoliation of others above, who now in turn must perish themselves if compelled to desist from using the water which they have unlawfully appropriated. The commissioners therefore make the following recommendations:

RECOMMENDATIONS.

The joint commission therefore recommend to the two Governments they represent, that a treaty be entered into, as a final settlement of all questions past and future, regarding the distribution of the waters of the Rio Grande.

(1) That the United States cede to Mexico the small tract of land before referred to, but reserving corporate rights of the Southern Pacific Railway Company to the United States.

(2) Construct the dam as designed by the joint engineers.

(3) Remove the railroads from the bed of the proposed reservoir.

(4) Acquire the land to be submerged.

(5) And in some way prevent the construction of any large reservoirs in the Rio Grande in the Territory of New Mexico, or in lieu thereof, if that be impracticable, restrain any such reservoirs hereafter constructed from the use of any waters to which the citizens of the El Paso Valley, either in Mexico or in the United States, have right by prior appropriation, and provide some legal and practicable remedy and redress, in case such waters should be used, to the citizens of both countries. And that thereafter the two Governments provide by joint representatives or mixed commission who are to reside at their respective ends of the dam, for a permanent distribution of the flow, as follows:

One-half or so much of one-half as may be required to the Mexican side of the river for such use as the Mexican Government may see proper to apply it.

One-half or so much of one-half as may be required to the United States side for similar use by the United States.

And all the remaining flow not required by either nation to the bed of the river, so regulated by partially depleting and refilling the reservoir as to maintain as far as practicable, a constant and uniform flow, for the purpose of avoiding a change of its bed (the boundary) by erosion or avulsion.

And in consideration of all the foregoing, that Mexico relinquish all claims for indemnity for the unlawful use of waters in the past, and accept the dam so constructed as an equitable distribution, past and future, of the waters of said river, so long as the United States conform to what is stipulated above.

That the United States defray all the expenses of the works of the dam, waste ways, outlets, etc.; the removal of the two railroads from the bed of the reservoir; the condemnation of the land; and have charge of the construction of the dam; and that Mexico be put to no pecuniary expense in the matter save the salaries and maintenance of such representatives as may be desired to witness the construction of the work and see that it be carried out according to the stipulations of the treaty and the specifications of the work.

In view of the importance in getting this subject before the present Administration in Washington in time to receive attention from both the executive and legislative departments, and thus avoid the long delay that would necessarily occur should the matter be laid over to a new Administration, having given the matter no previous study, it was decided that the United States commissioner would proceed at once, upon the signing of this journal, to Washington, to hand in person to the Secretary of State his copy of the proceedings, and that the Mexican commissioner would proceed at once to Mexico, to carry his copy to his Government, with a request that the Mexican Government approve or disapprove these proceedings at as early a date as practicable, and telegraph the result to the Mexican minister in Washington, in order that there may be as little delay as practicable in the two Governments bringing this matter to a final determination.

If the United States permits the construction of the Elephant Butte Dam (or other similar structures) on the river in New Mexico, the commissioners concur in the opinion of the engineers that the work should be done under United States or international supervision, as the release of such a vast body of water would not only endanger life and property below it, but possibly destroy the international dam, 120 miles below, should it be built, and entail further destruction.

The population of the El Paso Valley is at least 50,000, all dependent upon the flow of the water in the Rio Grande. The engineers, in their report, place the population at 20,000.

At 2 p. m. the joint commission, having concluded the consideration of the subject of the distribution of the waters of the Rio Grande, and the proposed international dam at or near El Paso, thereupon adjourned.

ANSON MILLS,
United States Commissioner,
JOHN A. HAPPER,
United States Secretary,
F. JAVIER OSORNO,
Mexican Commissioner,
S. F. MAILLEFERT,
Mexican Secretary.

EL PASO, TEX., November 18, 1896.

Col. ANSON MILLS, U. S. A.

DEAR SIR: I hereby agree to make a good and perfect title to 240 acres of land out of survey 261, adjoining the Cañutillo grant, for the price of \$8 per acre.

Very respectfully,

JOSEPH MAGOFFIN,

EL PASO, TEX., November 18, 1896.

Col. ANSON MILLS, U. S. A., City.

DEAR SIR: We, the undersigned, hereby agree to make a good and perfect title to what is known as the Cañutillo grant for the price of \$8 per acre.

This grant embodies, say, 1½ leagues, or 6,632 acres.

Very respectfully,

GEO. B. ZIMPELMAN,
JOSEPH MAGOFFIN,
J. F. CROSBY.

X.

CHICAGO, ILL., November 16, 1896.

Col. ANSON MILLS,

Commissioner International Boundary.

No. 2 Dupont Circle, Washington, D. C.

DEAR SIR: Referring to the correspondence between us in regard to removal of our present roadbed from Anthony to El Paso by reason of the proposed construction of an international dam across the Rio Grande River near El Paso, Tex., I beg to advise you that we are prepared to make this proposed change of line for the sum of \$522,728.36. This is an increase of \$98,899.36 over Mr. Follett's figures, and I submit below the details of such increase:

Right of way, \$3,680. Mr. Follett makes no allowance for right of way, but there will be some expense in connection with the removal and changes, and while we have eliminated all State land, assuming that right of way would be granted through it (and our bid is based on such assumption), I do not think the estimate as above is unreasonable.

Grading, \$20,071.50. This increase is due to reclassification by our engineer, who has gone very carefully over it, and he thinks that it is not excessive.

Bridging, \$932.50. There is no material increase in this item.

Cast-iron pipe, \$10,767.05. Mr. Follett's prices are not sufficient to cover freight charges at our "company material" rate per ton-mile of three-fourths of a cent, and the increase of estimate is also partly due to our opinion that more pipe should be provided than he has estimated.

Cross ties, \$12,681.20. This increase is also due to our freight charges, as above.

Telegraph, \$846.50. This is not a material increase.

Taking up old track, \$4,550. This item Mr. Follett omitted entirely.

Track laying and surfacing, \$6,370. Mr. Follett's estimate is \$400 per mile, but he evidently did not include engine and train service and the expense in material yard, all of which will increase the actual cost to at least \$750 per mile.

Sidings, \$2,705.70. Mr. Follett has only estimated for 1 mile, at a cost of \$2,000. The above increase is for such additional spurs as are on the existing track.

Salvage, \$5,000. Mr. Follett estimates old rails taken out of present line to be worth \$25 per ton. This is higher than our customary charge for old rail taken up.

Compensation for increased maintenance, \$47,800. This increase is caused by the additional mileage and height of trestlework which will be required on the new line. On the present line there are only 1,035 lineal feet of low trestle, while on the proposed line there are 2,840 feet, much of which is from 30 to 45 feet in height.

Engineering and incidentals, \$7,629.04. This increase is for incidentals to cover engineering and other expenses not included in the above.

The above items foot up a total of \$122,713.91. Mr. Follett, however, in figuring the cost of steel rails and fastenings, has computed them at much higher prices than now prevail, and we figure a decrease of these items under Mr. Follett's figures of \$25,814.55, which, deducted from the grand total above named, gives a net increase over Mr. Follett's figures as first shown, viz. \$98,899.36.

While we are prepared to remove our line as above stated for \$522,738.36, it is also proper for me to state that should a more careful location and better knowledge of the situation than it has been possible to acquire in the limited time at our disposal develop the fact that we can reduce the cost, we shall be pleased to give the Government the benefit of any reduction so obtained. We desire only to reimburse ourselves for the actual cost of the work, appreciating the many advantages which would accrue to us by reason of the construction of the dam.

Trusting that the above will be satisfactory, I beg to remain,

Yours, very truly,

E. P. RIPLEY, *President.*

Y.

SOUTHERN PACIFIC COMPANY,
New Orleans, November 17, 1896.

Col. ANSON MILLS,

Third Cavalry, United States Army.

*Commissioner, International (Water) Boundary Commission,
No. 2 Dupont Circle, Washington, D. C.*

DEAR SIR: Referring to previous correspondence had with you on the subject of furnishing an estimate of the cost of removing the track of the Galveston, Harrisburg and San Antonio and of the Southern Pacific Railroad of New Mexico from the area proposed to be submerged by the construction of an international dam near El Paso, Tex., I beg to inform you that as close an estimate as could be made in the limited time available has been prepared by our chief engineer. We wish it distinctly understood, however, that the estimate is not a very close one, and we would not wish to be bound by it in the event of the construction of the dam. The total cost is also based on a temporary use of the Santa Fe track during the reconstruction of our permanent bridge; the cost of doing this necessarily can not be included in the estimate, as we have not approached the Santa Fe as to the rental they would expect, and could make no estimate of what they would ask us. No estimate has been made of the cost of right of way, as it was assumed the Government would furnish this free to the company, and of a width at least equal to the present right of way, and in all cases sufficient to get the necessary material to build the new line. Under these assumptions the entire cost foots up \$447,385.68.

Trusting that this will reach you in time, I remain,

Yours, very truly,

J. KRUTTSCHNITT, *General Manager.*

ENGINEERS' JOINT REPORT TO THE INTERNATIONAL COMMISSION.

EL PASO, TEX., November 24, 1896.

To the International (Water) Boundary Commission.

GENTLEMEN: We have the honor to submit the following report in relation to the matters referred to us for investigation by action of the commission taken at its meeting of August 17, 1896.

The scope of this investigation is outlined in the following extract from the proceedings of the commission:

"The engineers to take up and as far as practicable complete the following:

"(1) Locate the site for the proposed dam.

"(2) Develop thoroughly the bed rock.

"(3) Make one or more working plans, with estimates of cost in detail for the dam itself and all appurtenances, such as by-wash and outlets.

"(4) Survey and make an accurate map of whatever land may be necessary to cede to Mexico in order that Mexico may possess one end of the dam on her own territory.

"(5) Make thoroughly all investigations practicable as to flow of the waters at different points on the Rio Grande and its tributaries, as contemplated in the agreement between the two Governments.

"(6) Enumerate and measure all the ditches and reservoirs that are now taken from the Rio Grande and its tributaries and measurement of flow, as far as practicable, and determine theoretically as far as possible the question whether or not, after these ditches and reservoirs are supplied, the present flow of the river will maintain the proposed reservoir year by year."

The progress of the work has been greatly embarrassed by lack of funds on the American side, the United States Congress having made no appropriation for the current fiscal year to provide for the expense of this investigation. The available funds have, therefore, only been sufficient on the American side to permit the employment of one assistant engineer, whose time has been fully occupied in collecting statistics as to the water in the river and ditches above El Paso. The important work of surveying the possible sites for the dam and making borings to develop the bed rock has therefore devolved upon the Mexican engineers. We have, however, had frequent conferences, and the data collected by each side have at all times been accessible to both.

We will now discuss the questions referred to us in the order in which they are given above.

1. LOCATION OF THE SITE OF THE DAM.

We understand the dam referred to above to be the dam described in the report made by Col. Anson Mills to the Geological Survey in 1889, or any other structure which will have the effect of flooding the valley above El Paso to the level indicated in that report, namely, 3,775.5 feet above mean Gulf level, as determined from the bench marks of the Southern Pacific Railroad Company. This fixes the height of the dam; and we have given no consideration to the question of the advisability of building a higher or a lower structure, which would affect both the storage capacity of the reservoir and the area of land to be overflowed, two essential elements of the problem which we assume to have been heretofore determined to the satisfaction of the commission.

A dam of this height can only be built with safety upon a solid foundation; and as the valley below has already a population of upward of 20,000 people, it is manifest that no experimental or uncertain type of construction can be adopted. As the bed of the river from El Paso to the upper end of the gorge above consists of loose, clean sand and gravel to great depths, there remains no choice as to the type of construction, masonry being the only type available. Now, since a masonry dam of this height requires a rock foundation, the selection of the site is at once limited to those points in the gorge above El Paso where the bed rock lies at depths which are not prohibitory.

So far we have found but one such cross section in the gorge, the depth to the bed rock at this point not exceeding 87 feet. Provisionally, therefore, for the purpose of making an estimate, we have located the dam on this section as shown on sheet 1 of the accompanying topographical map of the gorge, Exhibit A.

We are, however, of the opinion that before construction is actually begun additional borings should be made with a view to improving the location if possible.

2. DEVELOPING THOROUGHLY THE BED ROCK.

The making of borings to depths greater than 50 feet is very slow and expensive work.

The time and funds available in this case have not been sufficient to demonstrate thoroughly the location of the bed rock throughout the gorge at El Paso, but it has been fairly well determined that there is no location in the gorge where the depth to bed rock does not exceed 50 feet, and there is at least one section where the maximum depth is 87 feet; the first statement being based mainly upon the soundings taken in 1889.

The borings recently made are shown in plan and section on the drawings herewith, Exhibits A and B.

They consist of holes sunk with ordinary artesian-well appliances and lined with 6-inch pipe. Samples of the materials brought up from the bottom of the holes were taken from time to time. When rock was struck, it was tested by drilling a hole into it to a depth of 2 feet with an ordinary drop drill. In all cases the rock found at the bottom of the hole was compact limestone similar to that which forms the sides of the gorge.

While the evidence above is fairly conclusive, it does not furnish data sufficient on which to base working drawings and commence construction; many more borings are necessary to develop in detail the proposed site, and they should be sunk deeper into the rock.

3. WORKING PLANS AND ESTIMATES.

On account of the lack of time and data, working drawings can not be submitted at this date. We believe, however, that we have information sufficient on which to base a provisional estimate of cost.

In preparing this estimate we have duly considered the following special difficulties:

Much of the foundation must be sunk to a depth of nearly 100 feet through coarse sand and gravel, saturated with water. This will be a work of considerable difficulty, necessitating special methods.

During much of the time a moderate flow in the river will have to be dealt with, and during many months the work is likely to be interrupted by floods.

Special precautions will have to be taken to avoid risk of the dam being carried away by a flood while in process of construction before it has reached such a height as to make the spillways operative.

The records of the Geological Survey indicate that the flood of 1891 carried past El Paso about 1,432,000 acre-feet of water in four months, or enough to fill the proposed reservoir nearly three times.

On the other hand, the area of the reservoir is such that we feel no concern as to the maximum daily discharge, of which there is a record of 16,000 second-feet, but have based our estimates for the necessary spillways upon the maximum monthly discharge, which is a little less than 12,000 second-feet.

Assuming the highest permissible level of the water to be 3,775.5 feet above Gulf level, as before stated, we have placed the crest of the dam at 3,781.5 feet and the crest of the spillways at 3,771 feet.

We have located the pipes for drawing off the water in tunnels which will also serve to carry the low-water flow of the river during construction.

ESTIMATE.

Rubble masonry above ground, 35,638 cubic yards, at \$7.....	\$249,466
Rubble masonry in foundation, 58,093 cubic yards, at \$10.....	580,930
Two spillways.....	55,000
Two service tunnels.....	27,000
Six 48-inch service pipes.....	43,000
Valves and appurtenances.....	16,000
Administration and contingencies, about 15 per cent.....	145,604
Total.....	1,117,000

4. MAP OF LAND TO BE CEDED TO MEXICO.

The outlines of this piece of land are shown upon sheet 1 of the topographical map herewith. It is described as follows:

Being that piece or parcel of land containing about 98 acres lying in the Territory of New Mexico, county of Donna Ana and bounded as follows: Starting from a point in the middle of the railroad bridge on the right bank of the Rio Grande immediately above the site of the International dam and proceeding due south along the meridian to its intersection with the parallel of latitude of $31^{\circ} 47'$ north, a distance of about 2,772 feet; thence due east along said parallel of latitude to the middle of the normal channel of the Rio Grande, a distance of about 1,312 feet; thence along said center line of the channel of the Rio Grande to its intersection with the meridian through the point of beginning, a distance of about 4,274 feet; and thence south along said meridian to the point of beginning, a distance of about 125 feet.

5. INVESTIGATIONS AS TO THE FLOW OF THE RIO GRANDE.

Existing data as to the flow of the Rio Grande are very meager, and are mostly embodied in the reports of the United States Geological Survey. They are very fully discussed in the accompanying report of Mr. W. W. Follett, assistant engineer.

The river is often dry for months and at other times is subject to destructive floods.

6a. ENUMERATION AND MEASUREMENT OF DITCHES AND RESERVOIRS ABOVE EL PASO.

The systematic collection of all the existing data as to the ditches and reservoirs in the Rio Grande basin above El Paso was a difficult piece of work to be accomplished in the few months allowed for this investigation. Mr. W. W. Follett, assistant engineer, was detailed for this duty, and his report herewith is the best evidence of the skill and untiring energy which he has devoted to the task. This report gives in detail the enumeration of the ditches and reservoirs, as called for, but no attempt was made to measure these structures, as time and money would not permit. Briefly, it may be stated, that there are 925 irrigation ditches drawing water from the Rio Grande and its tributaries in Colorado and 603 in New Mexico; the number of storage reservoirs is 4, having an aggregate capacity of 31,300 acre-feet.

6b. WILL THE PRESENT FLOW OF THE RIVER MAINTAIN THE PROPOSED RESERVOIR YEAR BY YEAR.

The cubic contents of the proposed reservoir is estimated at 535,000 acre-feet. A study of the existing data as to the flow of the Rio Grande, collected by the Geological Survey, and quoted and discussed in the appendix to this report, would indicate that the least annual flow of the river is somewhat in excess of this amount. We are therefore of the opinion that the present flow of the river is sufficient to supply the reservoir. It is, however, apparent that no dependence can be placed upon the river continuing to maintain the supply year by year, unless some steps are taken to regulate for the future the construction of reservoirs in its valley and the diversion of its waters. The necessity for Federal control, or other efficient means of supervision and regulation, is made still more apparent when it is considered that the rupture of an improperly constructed dam above might readily entail the destruction even of one which has been carefully built below; and these structures are on such a vast scale that it would be difficult to estimate the magnitude of the disaster.

In submitting this report we wish to acknowledge the cordial and efficient assistance of Mr. W. W. Follett, civil engineer, and of Don Alberto Flores and Don Manuel Calderon, ingenieros de caminos, puertos y canales; Don Manuel Canton, ingeniero civil; Don Eduardo Beaven, ingeniero topógrafo; Don José Meneses and Don Ignacio P. Trigos, tenientes de ingenieros del ejército Mexicano; Don Pedro Meneses, teniente del primer batallón de artillería, and Don Mauricio C. Castro, ingeniero civil.

Respectfully submitted,

GEO. MCC. DERRY,
Captain of Engineers, United States Army.
 J. RAMON DE IBARROLA,
Ingeniero del Gobierno Mexicano.

A STUDY OF THE USE OF WATER FOR IRRIGATION ON THE RIO GRANDE DEL NORTE.

By W. W. FOLLETT, *Civil Engineer.*

LETTER OF TRANSMITTAL.

EL PASO, TEX., *November 17, 1896.*

Capt. GEORGE MCC. DERBY,
Corps of Engineers, U. S. A.

DEAR CAPTAIN: With this I hand you my report on a study of the use of water for irrigation in the drainage of the Rio Grande del Norte above El Paso, Tex.

This study was made for the purpose of investigating the claim of the Mexican Government that the people of the United States have taken from the inhabitants of Mexico water which was theirs by ancient right of prior appropriation. It also extends to a consideration of the probability of there being a water supply sufficient to successfully serve a reservoir at El Paso, the construction of which by the United States is suggested as a recompense to the Mexicans for their alleged loss of water.

Yours, truly,

W. W. FOLLETT,
Civil Engineer.

EL PASO, TEX., *November 17, 1896.*

Capt. GEO. MCC. DERBY,
Corps of Engineers, U. S. A.

DEAR CAPTAIN: On August 22, 1896, you handed me in El Paso, Tex., the following letter of instructions:

EL PASO, TEX., *August 22, 1896.*

Mr. W. W. FOLLETT, C. E.,
El Paso, Tex.

DEAR SIR: The commission have decided to adopt the plan of operations outlined by Colonel Mills in his memorandum to Mr. Osorno. The questions referred to me for report are, therefore, those mentioned in the second paragraph of that memorandum.

I would like you to begin at once collecting and arranging such data as can be obtained bearing upon these questions, and report them to me in such form as to make them readily available as the basis of an opinion.

As the first step in this direction, I would like you to proceed at once to Denver, and to such points as you may think necessary in the valley of the Rio Grande in Colorado and New Mexico, and interview the State engineer of Colorado and such other officials and individuals as may be able to give you information which will

enable you to complete a table showing as nearly as practicable a complete list of all of the ditches that have been taken out of the Rio Grande and its tributaries, with the date of construction of each ditch, its carrying capacity, the amount of water which it is legally authorized to take from the stream, and the amount that it has actually taken yearly since 1880.

Please make a similar report as to proposed and existing storage reservoirs in the basin of the Rio Grande above El Paso, and incidentally collect any information that you may be able to as to the annual flow of the river.

Owing to the limited time allowed for this investigation, I do not think it will be practicable to do any useful work in measuring the actual flow of ditches, as their flow at the time of observation will be no criterion as to their flow for the whole year.

Should you be unable to obtain from records, reports, etc., reliable information as to the carrying capacity of the various ditches, I would request that you so report as early as practicable, as it may in such an event become necessary to send a number of agents through the valleys to measure the slope and cross section of all the ditches.

In submitting your report upon this investigation I would be glad to have you accompany it with any suggestions you may be able to offer bearing upon the subject under consideration.

Until further orders will you kindly submit a weekly report detailing the progress made during the week?

On your trip through Colorado and New Mexico you will be accompanied by one of Mr. de Ibarrola's young assistants, to whom you will please give the fullest access to all of the data collected and ample opportunity to keep himself informed as to the impartiality and accuracy alike of the results and the methods employed. It has been understood with Mr. de Ibarrola that in complying with these instructions you are not to delay the progress of the work, as it is intended that the cooperation of his assistant shall be an assistance to you and no obstruction.

Very respectfully,

GEO. MCC. DERBY,
Captain of Engineers, U. S. A.

In addition to the above, you verbally instructed me to complete this field work by October 15. No copy of the memorandum referred to in the first paragraph of the above letter was furnished me, although I have seen the paper.

The work you outlined in this letter was for the purpose of gathering data to enable you to answer two questions raised by Mr. Richard Olney, Secretary of State, and Señor M. Romero, Mexican minister at Washington, in a convention signed by them on May 6, 1896. These two questions are suggested in the following paragraphs of the above convention:

First. The amount of water of the Rio Grande taken by the irrigation canals constructed in the United States of America.

Second. The average amount of water in said river year by year before the construction of said irrigation canals and since said construction, the present year included.

On August 25 I left El Paso accompanied by Mr. Alberto Flores, chief of Mr. de Ibarrola's staff.

We stopped one day at Santa Fe, N. Mex., where I found that there was no documentary data of the New Mexico irrigation, but that all information I obtained must be from actual field work. This I reported fully to you by mail from Santa Fe on the night of August 26, and after calling your attention to the small amount of funds available for field work and the limited time at our disposal, both of which precluded the actual measurement of carrying capacity of each ditch and the area watered therefrom, suggested the following:

Now, the only procedure which I can suggest that seems at all feasible is this: I will go on to Denver and get the available Colorado data, and then move into the San Luis Valley and there obtain from the water commissioners their statements as to the carrying capacities (when different from the decrees) of the ditches.

under each man's control, but make no effort at measurements of canals. Then we will go to Chama, N. Mex., hire a team and driver, go down the Chama to Espanola and through that valley and up to Taos. I will measure en route the larger ditches and gather the best data I can as to the smaller ones. When we have finished that trip I will send that team back to Chama, and we will come here (to Santa Fe) by train and get another team, go down Santa Fe Creek to the Rio Grande, and then follow the valley of that river, gathering by inquiry what data we can as to its tributaries and measuring the ditches taken out of the main river.

We reached Denver on the 27th and found that the State engineer's office had on file but little data relating to the use of water in the San Luis Valley beyond copies of the decrees in each district, partial copies of which we already had. These copies I completed and, after getting what information I could in Denver from gentlemen familiar with the country to be examined, we left there on September 3, en route for the San Luis Valley. Before leaving Denver I received the following telegram from you:

Go ahead as proposed in your report of August 26; in the meanwhile I will see if additional funds can be obtained.

We went first to Del Norte in order to consult with Mr. Francis T. Anderson, the superintendent of irrigation in water division No. 3 of Colorado, which comprises the whole of the San Luis Valley. We found him an energetic and intelligent man, and he has been of much assistance to me in this investigation. He informed us that he had instructed the commissioner in each of the seven water districts under his control to furnish him complete statistical reports of the use of water and acreage irrigated during the year. I requested him to have them give him, in addition to the information already asked for, the actual capacity of each ditch in its present condition, regardless of its original size or of its decree, and to furnish me with a copy of all data thus obtained. This he agreed to do.

After careful consideration of the time it was absolutely necessary to devote to the New Mexico drainage in order to enable me to make anything approximating a complete statement of the use of water therein, I decided that it would be best to trust to Mr. Anderson to furnish the Colorado data, and to go on to Chama as quickly as possible. This we did, after spending one day in district No. 35, a small area where the canals have never been adjudicated and which has no commissioner, and a day at Antonito, where we obtained much valuable information from Bishop John C. Dalton, of Mauassa, the water commissioner for district No. 21. Later developments have shown that it would have been better for us to have spent a few days more in the valley, as the commissioners were very slow in getting their information into Mr. Anderson's hands, and their reports as to carrying capacity are not correct, being in several districts merely copies of the sizes given in the decrees. These, as I will show you more in detail later, may have no relation whatever to the actual capacities. This was not Mr. Anderson's fault, but probably a misunderstanding on the part of the water commissioners.

We reached Chama on September 7. There we were delayed two days getting our outfit together for the wagon trip. On the 9th Mr. Flores was called by wire to Mexico, and he left by rail that day. I regretted his enforced departure very much, as I had found that he had a clear insight into the purpose of our work and he had been of great aid to me during the few days we had been together.

On the day of Mr. Flores's departure I started down the Chama on S. Doc. 229—4

horseback, with team, camp, and driver, adopting the method of work outlined in my letter of August 26. I so laid out my line of travel as to enable me to reach and examine the larger areas watered. I measured the larger ditches, obtained either from the more intelligent residents or by examination and rough estimate the area watered, and picked up what information I could as to the age of ditches, relative amount of land watered each year, abnormally dry years, etc. For the irrigated areas which I was unable to reach in the limited time at my disposal I obtained what information I could from the inhabitants of the country passed through and supplemented this with the knowledge I already had of the country, obtained by reconnoissance work done for the United States Geological Survey in the winter of 1889-90. On the two trips I saw over 95 per cent of the irrigated land in the New Mexico drainage of the Rio Grande. On this last one I traversed between 75 and 80 per cent of it.

Early in the progress of this investigation I became convinced that the capacity of the ditches was not a safe basis for an estimate of the amount of water used, as I will explain to you more fully further on, and so obtained estimates of the acreage served as well as of the carrying capacity of the ditches listed.

I covered the Rio Grande drainage of New Mexico above Santa Fe fairly well by September 19, leaving my team at Antonito on that date and coming to Santa Fe September 21. There I was sick for four days, but outfitted with team, camp, driver, and saddle horse and left there September 25. I was joined at Santa Fe by Mr. M. G. Canton, a young Mexican engineer sent by Mr. de Ibarrola to represent his Government on the trip. I found Mr. Canton to be a bright and energetic young man, a congenial companion, and a valuable assistant in our work.

Between September 25 and October 11 we covered the Rio Grande drainage above El Paso, traveling some 500 miles by wagon in that time. On the latter date we started our team, driver, and saddle horse north from Anthony, N. Mex., 20 miles north of El Paso, while we came to the latter place by rail.

Since my arrival in El Paso I have been compiling and arranging the statistics gathered, so as to present them to you "in such form as to make them readily available as the basis of an opinion."

Accompanying this report are:

A land-office map of Colorado, showing the water districts of the San Luis Valley, marked "Exhibit A."¹

A map of the San Luis Valley, showing the location of some of the larger ditches, marked "Exhibit B."¹

A map of a portion of district No. 22, marked "Exhibit C."¹

A land-office map of New Mexico, marked "Exhibit D."¹

Some 95 double pages of compiled statistics and tabulations therefrom, more specifically described in the table of contents prefacing this report.

Before entering into a discussion of these records I wish to give you a brief description of the country under consideration, with special reference to its water supply, and a rough history of its development, thinking that, as it is a country, a population, and an economic condition unfamiliar to you, such a statement may be an aid to you in forming your opinion on the subjects under consideration.

¹ Public documents.

II. DESCRIPTION OF COUNTRY.

Please refer to Exhibits A and D.¹

The drainage area tributary to the Rio Grande above El Paso has an area of about 38,000 square miles, and is roughly divided as follows:

	Square miles.
Area in the mountains above Del Norte, Colo. (this area furnishes all the water which passes the Del Norte gauging station).....	1,400
Area in the rest of the mountain drainage tributary to the San Luis Valley.....	3,200
Area of the San Luis Valley proper.....	2,400
Total area of drainage in Colorado.....	7,000
Area in New Mexico whose run-off enters the Rio Grande above Embudo gauging station, including Taos Mesa.....	2,600
Total area of drainage above Embudo.....	9,600
Area of Chama drainage.....	3,300
Area in addition to Chama drainage whose run-off enters the Española Valley.....	800
Total area of drainage above Rio Grande gauging station.....	13,700
Area of Jemez drainage.....	900
Area of Puerco.....	6,400
Area of tributary small drainages whose run-off enters the Rio Grande above San Marcial.....	5,700
Area above San Marcial sloping to the Jornada del Muerto.....	3,300
Area below San Marcial furnishing no run-off.....	1,300
Area between San Marcial and El Paso furnishing a small run-off.....	6,700
Total area above El Paso.....	38,000

Of the total area of 9,600 square miles above the Embudo gauging station, some 2,600 square miles in the north end of the San Luis Valley furnishes no water to the river, so that the net area giving run-off to the Embudo gauging station is about 7,000 square miles.

This same 2,600 square miles deducted from the total area of 13,700 square miles above the Rio Grande gauging station leaves about 11,000 square miles furnishing run-off.

From the 26,700 square miles above San Marcial should be deducted this 2,600 square miles and also about one-third of the Puerco drainage (of 2,100 square miles) from which no run-off comes, and there is left 22,000 square miles furnishing run-off to the attempted San Marcial gauging station.

From the 38,000 square miles above El Paso should be deducted this 4,700 square miles and also the two areas of 3,300 and 1,300 square miles on the Jornada del Muerto, leaving some 30,700 square miles furnishing run-off to the El Paso gauging station.

This drainage area stretches through $6\frac{1}{2}$ degrees of latitude (from 32° to $38^{\circ} 30'$ north), ranges in elevation from 3,700 feet above sea level at El Paso to 7,500 in the lowest part of the San Luis Valley, 8,000 along its margins, and over 14,000 on the peaks surrounding it, and has an annual precipitation ranging all the way from less than 10 inches at El Paso and for a long distance up the valley to over 30 inches in some parts of the mountains of Colorado.

The Rio Grande's source is high up on the continental divide, where the Sangre de Cristo range of mountains springs from the parent hills and sweeping to the north and east around the San Luis Valley, then swinging to the south, extends with its snow-capped peaks to the

¹ Public documents.

Glorieta divide east of Santa Fe, throwing out a spur to the west above that place, which, after parting in a chasm through which the river flows, terminates in the lofty Jemez Mountains, while the Conejos range on the west runs southward between the main river and its largest tributary, the Chama, furnishing to both a large amount of snow water from its high plateaus and peaks. It is from this portion of its drainage area that the Rio Grande receives the greater part of the water which passes El Paso. On it the snowfall is heavy in ordinary winters, while south of Santa Fe and the Jemez Mountains but little snow ever falls and none remains any length of time upon the ground. The annual precipitation there comes in violent downpours. The streams are torrential rather than perennial, as are nearly all those above the Jemez Mountains.

In detail the topography and water supply of the country is about as follows:

The great valley on the head of the river, formerly known as San Luis Park, is properly divided into two sections. All of it which is included (see Exhibit A) in water districts Nos. 25, 26, and 27, together with that portion of district 20 which lies north of Alamosa, aggregating in area about 2,600 square miles, never furnishes any water, so far as surface flow is concerned, to the Rio Grande, while its subsurface flow, if there be any, is very small. Not only is this true now, when large sections of the area in question have been irrigated, but it has been so since 1874 at least, and was probably so prior to that date.

The remainder of the Colorado area all furnishes water to the main river.

The San Luis Valley is a wide stretch of smooth land with a fall of 3 to 5 feet per mile along the main stream and a fall from the hills to the channel of the river of from 5 feet per mile up to 15 or 20 feet. The soil is generally underlaid with gravel, and when supplied with sufficient water produces a good crop of wheat, oats, or barley. The season is too short for the production of corn. The Rio Grande flows some 60 miles through the mountains before entering this wide plain at Del Norte. There its course continues nearly due east to Alamosa, where it swings to the south. Its channel, while well defined, is shallow, being at Alamosa only 6 to 8 feet below the general level of the ground. It is in coarse gravel, not easily eroded, and headworks of ditches are easily maintained.

Near the lower end of the San Luis Valley the river receives tributaries, the most important being the La Jara, Alamosa, Conejos, and San Antonio from the west, and the Trinchera, Culebra, and Costilla from the east. All of these bring into the main river large amounts of water each spring, except when the snowfall of the previous winter has been abnormally light.

Across the lower end of the valley is thrown a lava flow through which the river cuts its way, forming a cañon which is about 100 feet deep at the State line, but deepens to fully 700 at the mouth of the Rio Hondo and holds that depth until within a few miles of Embudo. No living water enters this cañon from the west, but several good streams bring water from the east. These are the Rio Colorado, Rio Hondo, Taos, and Penasco, or Embudo, all rising in the Sangre de Cristo range, here called the Taos Mountains. They are all good streams flowing the year around, except that during the summer of exceptionally dry seasons the Taos sometimes goes dry below the Taos

mesa, all of its waters being used for irrigation. There is no arable land along the main river in this cañon, but all of the streams coming from the east water good bodies of land. The fall of the river is some 30 feet to the mile from the Colorado line to Embudo.

Immediately below Embudo the river enters the Espanola Valley, which is some 25 miles long and from 1 to 3 miles wide. In this valley it receives the water of Santa Cruz River from the east and that of Chama from the west. The latter is an important stream, draining a large area of mountain country and furnishing much water to the Rio Grande. The Espanola Valley is very fertile and produces grapes, apples, and peaches in abundance, besides corn and wheat.

At the lower end of the Espanola Valley the river cuts through the high ridge, before mentioned as connecting the Santa Fe and Jemez Mountains, forming White Rock Cañon, a narrow, tortuous gorge, some 15 to 20 miles long and, in places, 500 feet deep. Here the fall of the river is some 10 feet to the mile, its fall in the Espanola Valley being somewhat less than this amount.

About due west of Santa Fe the river leaves the White Rock Cañon and enters a long and narrow valley, bounded on either side by mesas which rise abruptly to a height of 300 to 500 feet above the valley and then slope gently upward to the foot of the mountains. Nearly all of these mesas have a good soil, but no water supply for irrigation, and hence are valueless except for pasturage.

This valley extends as far south as San Marcial, some 150 miles below the cañon, there being two or three short cañons in this distance. It varies in width from 1 to 3 or 4 miles, and outside of that portion occupied by the wide, sandy, and ever-shifting bed of the river, is a fertile agricultural land. But one tributary enters the river in this distance which brings in any large amount of snow water, and this comes for a short time in the spring only. This is the Jemez, which has its source in the high mountains west of the White Rock Cañon, where the snowfall is quite heavy. Santa Fe and Galisteo creeks also sometimes deliver from the east some water in the spring, but they are usually dry.

Sixty miles below Albuquerque the Rio Puerco enters from the west. This river drains a large area of country, but on all of it the snowfall is very light, and the rainfall comes principally in sudden heavy downpours, so that the Puerco is a torrential stream when in flood, but is dry nine-tenths of the time. While its drainage area, as before stated, is about 6,400 square miles, it is not likely that over two-thirds of this area ever delivers water to the Rio Grande.

From San Marcial to a point some 20 miles above Rincon, about 100 miles by river, the hills abut closely onto the channel of the stream, there being but little valley land. From the west enters several small tributaries, which have cut down deep into the Mesa Cuchilla Negra; each of these has along it a narrow fertile valley, and, while each brings to the Rio Grande some snow water in the spring from the Black Range lying to the west, dependence for a summer water supply rests on springs which appear in the bed of the stream about halfway between the mountains and the Rio Grande.

A range of hills jut out from the Cerro Montoso northeast of Socorro and abut to the river. South of these begins a wide and level mesa, which extends south to Las Cruces. It is named the Jornada del Muerto, and is about 125 miles long and from 15 to 30 miles wide. About 200 square miles of its surface are covered with a lava flow,

but at least two-thirds of the rest is good pasture land, producing a heavy growth of grama grass. The Caballo and Fra Cristobal mountains separate the Jornada from the river near the middle of its length.

There is a good valley reaching 20 miles or more up the Rio Grande from Rincon, and then the mesas again close into the river, forming Seldon Cañon.

At Leasburg, some 25 miles below Rincon, the hills flatten out and recede from the river and the Mesilla Valley begins. This is some 60 miles long, going south to the pass 4 miles above El Paso, Tex., and is from 2 to 4 miles wide. The pass is only 3 or 4 miles long, and then the river, which here forms the boundary line between the United States and Mexico, enters the El Paso Valley.

III. HISTORICAL.

Before the middle of the sixteenth century the Spaniards entered New Mexico and the valley of the Rio Grande and there found the Pueblo Indians, living in their many-storied towns and cultivating the land of the valleys, bringing water onto it by acequias, or irrigating ditches, many of which are still in use to this day. How long these Indians had been on the ground is unknown, but they were even then old inhabitants, and raised not only grain and fruit, but even flowers, as one poetical and doubtless homesick Spaniard wrote that roses bloomed along the acequias bank "as bloomed the roses of beautiful Aragon." There are some seventeen or eighteen of these settlements of Pueblo Indians in New Mexico, each holding a land grant 2 leagues square and each with its old pueblo, containing from 200 to 600 people. There were at least this number of pueblos when the Spaniards came to the country, and probably several more, as the ruins of three or four still exist. The inhabitants of each pueblo were then much more numerous also than now. In other words, prior to the middle of the sixteenth century, three hundred and fifty years ago, there were some 15,000 to 20,000 people living from products raised by irrigation in the Rio Grande drainage above the Jornada del Muerto, and the area of irrigated land probably exceeded 30,000 acres.

While the Spaniards first entered New Mexico from Sonora and the Gulf of California, the first attempts at colonization were made from El Paso as a base, the Spanish conquest of Mexico having extended to the Rio Grande. This first attempt was made in 1598, and the first Spanish capital of New Mexico was then established at Chamita, in the Espanola Valley, just above the mouth of the Chama. This was abandoned in 1605, and the inhabitants and capital transferred to Santa Fe, where they and their descendants remained until 1680, engaged principally in mining. Then the Pueblo Indians revolted and drove the Spaniards from the country. In 1692 it was reoccupied by the Spaniards and permanently held. Bernalillo was founded about 1700 and Albuquerque in 1706. Settlements were made along the Rio Grande, both in the Albuquerque and Espanola valleys, and also up the Chama, the Abiquiu grant on the latter stream being made to the inhabitants of that town in 1739. El Rito, some 20 miles northeast of Abiquiu, was occupied in 1730.

The Mexicans did not penetrate to the San Luis Valley, judging from the water rights there granted, until after 1850, the oldest water claim in that valley being that of the San Luis People's Canal, on Culebra Creek, whose appropriation dates back to 1852. For the ten

or twelve years after 1852 the settlements in the San Luis Valley were confined to the country on the Costilla and Culebra and to the Conejos Valley, the town of Conejos being founded in 1855. In 1866 and 1867 settlements were started on the Rio Grande, San Luis, and Saguache, while the next three years saw farms opened and small ditches taken out on the Carnero, the La Gavita, Alamoso, and La Jara, but all of these, except those at Conejos, were confined to the little valleys back in the hills around the margin of the San Luis Valley proper. On these farms the principal product was hay. This the Mexicans fed in winter to their stock, to which the main valley furnished abundant pasturage for the greater portion of the year.

About 1873 or 1874 the Americans began to move into the San Luis, but still the farm lands were confined to the small side valleys. The first settlement in the San Luis Valley proper, outside of Conejos, was made by the Mormons, who founded Manassa in 1878 or 1879. Soon after this time the Denver and Rio Grande Railroad built into the valley. The main industry was still cattle raising, however, until about 1882. Then commenced the era of large canal building, which continued for ten years. During this time were built the Rio Grande, Monte Vista, Empire, San Luis Valley, Costilla, Prairie, and Farmers' Union canals, besides many others. All those named head on the Rio Grande between Del Norte and Alamosa, and, stretching 30 or 40 miles north and south from the river, cover the whole of the western half of the valley with their network of laterals. Colonists were brought in as rapidly as they could be found, and a great and brilliant future was predicted for the San Luis. But it was found that the water of the Rio Grande was not sufficient to supply these monster canals, that the soil was not in all cases as fertile as expected, and that the climate was very trying. For these reasons immigration was checked, and since 1892 the valley, instead of rapidly extending its irrigated areas, has not held its own.

While quite a large native American population has come into the Rio Grande drainage in New Mexico since the construction of the railroads in 1880, it is confined principally to the towns, and to-day fully 90 per cent of the irrigating in this section is done by Mexicans and Indians. These people pursue their ancient methods of irrigation unaffected by modern progress.

IV. IRRIGATION LAW AND SUPERVISION IN COLORADO.

Under an enabling act passed by Congress March 3, 1875, the people of Colorado adopted a constitution July 1, 1876, and the Territory became a State by Presidential proclamation on August 1, 1876.

The constitution of the State recites in Article XVI:

SEC. 5. The water of every natural stream not heretofore appropriated within the State of Colorado is hereby declared to be the property of the public, and the same is dedicated to the people of the State subject to appropriation as hereinafter provided.

SEC. 6. The right to divert unappropriated waters of any natural stream to beneficial use shall never be denied. Priority of appropriation shall give the better right as between those using the water for the same purpose, but when the waters of any natural stream are not sufficient for the service of all those desiring the use of the same, those using the water for domestic purposes shall have the preference over those claiming for any other purpose, and those using the water for agricultural purposes shall have preference over those using the same for manufacturing purposes.

Section 5 established what was then an innovation in the ownership of water, denying the old doctrine of riparian rights, which vests the title to the water of a nonnavigable stream in the owners of abutting property. California was the only State in the Union in 1876 where irrigation was in vogue, and the supreme court of that State decided recently that riparian rights must there be respected. I think, however, that the constitutions of several of the States admitted since 1876 have followed the Colorado precedent in the framing of that clause of their constitutions relating to the ownership of water.

In 1879 the Colorado legislature passed voluminous irrigation laws. These provide for the division of the State into water districts, bounded by natural watersheds, and for the adjudication of water rights in each district by the district court within whose jurisdiction the territory may lie. These districts were afterwards grouped into water divisions and the governor authorized to appoint a superintendent for each division and a commissioner for each district from men recommended by the county commissioners of the county or counties in which the water division or district lies. The duty of these officials is to distribute water among the different ditches in the proportions and priorities prescribed by the court decree. The water commissioners report to the superintendent and the superintendent to the State engineer. The system is very faulty in its working, because the State engineer has no disciplinary power over his staff, except to recommend to the governor the removal of an offending subordinate, and likewise the superintendent of a division can not compel obedience from the commissioners under him. Moreover, the water commissioners receive their pay from the county, their bills for service being first passed on by the county commissioners, and the latter may reduce or reject altogether these claims, so that a water commissioner, when carrying out peremptory orders from the State engineer or the superintendent of his division, has no assurance that he will be paid for his labor. The working of the system is very cumbersome and unsatisfactory.

The San Luis Valley constitutes division 3, and is subdivided into eight districts, numbered respectively 20, 21, 22, 24, 25, 26, 27, and 35. The boundaries of these districts are shown in red on Exhibit A.¹

As the adjudication of water rights in a district is a very tedious process, the taking of testimony is generally placed in the hands of a referee, who is, unfortunately, obliged to be guided in his decisions entirely by the ex parte testimony of the claimants for water. They, of course, place their date of appropriation as early as possible, the carrying capacity of their ditch as large as they dare, and the area irrigated or irrigable just as large as they can figure it, and, unless some neighbor calls them down, the referee has no check on the accuracy of their statements. This results in ditches frequently getting appropriations—or decrees, as they are commonly called—largely in excess of their carrying capacity. For instance, 107 ditches in district 22 have an actual aggregate carrying capacity, as stated by the water commissioner, of 1,034 second-feet, while their decrees amount to 2,978.42 second-feet and their claimed capacity to over 4,000 second-feet. One hundred and seventy-one ditches in district 25 claim to have a carrying capacity of 2,501 second-feet, while the decrees amount to but 919.18 second-feet. The decrees of the San

¹ Public document.

Luis Valley were made on various bases, averaging about 1 second-foot of water of decree for each 50 acres irrigated.

All the districts except district 35, in division 3, have been organized and adjudicated and decrees issued on the following dates:

District 20	Nov. 17, 1891
District 21	July 11, 1888
District 22	1890
District 24	June 14, 1889
District 25	Mar. 28, 1890
District 26	Nov. 23, 1889
District 27	Feb. 23, 1890

In district 20 a new decree was issued in the spring of 1896 and the district was operated thereunder this year. The validity of the new decree has been assailed, with a good prospect of success, and as the district has worked under the old one for four years and is likely to return thereto next year or the year after, I have based my study of the district on the old decree.

The State legislature of 1889 passed a bill, which became a law, instructing the State engineer to gather each year and embody in his biennial report statistics as to the amount of water used and land irrigated by each ditch in the State. It became the duty of the water commissioners to collect this information under instructions from the State engineer and superintendents of the several divisions. The work had to be paid for, however, by the counties, and prior to 1896 the county commissioners in several counties have refused to allow the bills of the water commissioners for this work. This has resulted in either no statistics being gathered in those counties, or in what were obtained being collected in a perfunctory way from the returns made by the owners or managers of the different ditches, without any attempt at eliminating errors and obtaining accurate results. This has been especially true in the third division, no agricultural returns whatever having been made from there until 1895, when partial reports were returned from districts 20, 21, 24, 25, 26, and 27. This year Mr. Anderson, the superintendent, made an heroic attempt to obtain accurate returns. He has succeeded fairly well, although there are still many apparent discrepancies in them.

My report on the use of water in Colorado is based on the returns for 1895 and 1896, supplemented by quite a voluminous correspondence, both by mail and wire, with Mr. Anderson and other parties, and some information I collected in Denver, Alamosa, and Antonito. As before stated, it is to be regretted that more time was not spent in the valley in the personal gathering of data, as a few days of such work would have added very materially to the accuracy and consequent value of this report. This, however, was not done, and hence the statistics given you herewith must be considered with the limitations specifically stated under each district.

V. COMPILATION OF COLORADO DATA.

My method of procedure in collecting the data of each Colorado district has been as follows:

First. From the copy of the decree a list of ditches was made. This list was entered on a blank form containing 16 columns headed and filled in as follows:

1. "No. of ditch," starting from 1 in each district. The ditches of

each district are numbered in the order of their priorities, as given in the decree, and are supposed to show their chronological order of construction, regardless of their location.

2. "Name."

3. "Stream," being the source of water supply.

4. "Date of first use." This date was assumed to be the year of the appropriation when it was made prior to July 15 and the following year when it was after that date. It is likely that in some cases this rule gives a date of first use one or two years too early, as appropriations are usually claimed as being made when the first action is taken looking to the construction of a ditch, and may antedate its actual use by several years, provided the claimant can show that he used "due diligence" in the prosecution of the work of construction. It is impossible to say just when this occurs, and so the above rule was adopted as the one most likely to be correct. Where several appropriations are made to the same ditch the several years are entered in this column.

5. "Decree." This is the amount of water which a ditch is legally authorized to take from the stream. In this column is entered the sum of all the appropriations made to a ditch, while the several appropriations for each year are entered in the last column on the sheet. Decrees are given in cubic feet per second.

6. "Possible acreage." This column is filled from the returns of the commissioners and the areas given are not reliable; in fact, it would be extremely difficult to say, even after a survey, how much and what land could be irrigated from each ditch, as conflicting ditches, extensions, etc., will constantly change the conditions. The information is given merely as a guide to show, in a general way, what proportion of irrigable lands in each district are now cultivated.

7. "Capacity." In districts 20, 21, 22, and 24 the quantities in this column are approximations to the actual capacities, but are none of them exact, as no rating flumes are in existence in the San Luis Valley and but few of the ditches have been rated. In districts 25, 26, and 27 the capacities returned by the water commissioners are copied from the decree, which, as before stated, is made up from the testimony of the claimants for water, many of whom do not know whether their ditch falls 10 feet or 100 feet to the mile, and who will give its size at its widest and deepest place, regardless of the rate of movement of the water through the cross section. As a natural result, the capacities given in these districts aggregate an amount several times as large as the total of the decree and probably many times as large as the actual carrying capacities. These are in cubic feet per second.

8. "No. of days," being the number of days that water ran in each ditch in 1895, as given in the returns for that year.

9. "Average per day," being the second-feet supposed to have been carried each day, taken from the returns for 1895.

10. "Acre-feet." Being (except as stated later on) the product of the number of days by twice the second-feet. This gives the correct result within 0.7 per cent an acre-foot, being 43,500 cubic feet of water, or the amount necessary to cover an acre of ground 1 foot deep.

11. "Acres." I had at hand only the totals for each water district for 1895, and so distributed the total amount uniformly among the several ditches included in the return.

12, 13, 14, 15. Same as 8, 9, 10, 11, but for 1896, except that the acres watered are as given for each ditch in the returns.

16. "Remarks." This column is filled principally with the separate items (where there is more than one) of each decree.

Second. After the list of ditches was compiled from the decrees and made up on this form all the information contained in the returns for 1895 and 1896 was entered in the proper place, together with what other information I might have. As before stated, I found early in the investigation that neither the carrying capacity of the ditches nor their decrees formed a safe basis for an estimate of water used, and so have put into these tables the acreage watered, in addition to the data specified in your letter of instructions.

Third. Wherever no returns were made—and some ditches were omitted in nearly every district—a reasonable assumption was made and the missing data supplied. This was done because totals are what you need and not partial returns.

Fourth. An assumption of total acreage was made in each district for each year from the date of the decree down to 1895. This assumption was based on what information I might have and its proportion to area watered in 1895 and 1896, as stated under the discussion of each one. This acreage was distributed among the different sheets of the district in proportion to the decrees shown thereon and the totals carried to the summation sheets for the district. I did not attempt to show separately the amount of water used by each ditch each year since 1880, as instructed, because it was, in my opinion, impracticable to do so, and, even if it could have been done, would have made the tabulations some four times as bulky as they now are, without adding materially to the information which is now contained on the summary sheets which I have compiled for each district.

Fifth. Starting from the date of the decree and with the acreage assigned to each ditch of a sheet, and the total decree and capacity shown thereon, I worked backward toward 1880, deducting year by year the decrees issued for the succeeding year, and a proportionate part of the capacity and acreage of each ditch having a lapsing decree where a prior decree existed, or the whole capacity and acreage of a ditch where all of the decree was gone. The results thus obtained were entered in the summary table for each district, thus filling up the table, with the exception of the amount of water used.

Sixth. After a careful study of all of the available data, I arrived at the conclusion that the maximum amount of water which can be absorbed and retained or evaporated by an acre of land in one season is 4 feet in depth over its surface, or 4 acre-feet per acre. In apparent contradiction of this conclusion will be found the fact that the returns give an amount of water run through many ditches, and supposedly used on the acreage returned, which equals much more than 4 feet per acre. This occurs as follows: A large percentage of the irrigated lands in division 3 are grass lands, lying along the margin of the streams. On these lands a constant flood of water is poured as long as there is an available supply, the greater part of which runs across the meadow and back into the stream to be again diverted by the ditch next below, where a large portion is again returned to the stream, but the whole amount is charged up in the returns against each ditch. Again, in seasons of short water supply a small amount, say 1 to 5 second-feet, may be kept running through a ditch to supply the inhabitants thereon with water for domestic use, they being forbidden the use of it for irrigation, and the greater part of this water returns again to the stream and is used for irrigation by some ditch lower down with a right prior to the one above. Yet all this water is

charged to the first-mentioned ditch. Hence, in filling columns 10 and 14 of the statements when the number of days water ran multiplied by twice the amount carried in second-feet would equal more than four times the acreage, I have inserted the latter product instead of the former.

This has given me the total amount of water used in 1896, and, where the returns were complete for 1895, the amount used that year also. For the years from 1880 to 1895 I proceeded as follows:

From Mr. Anderson I obtained the following statement:

I give you herewith the consensus of opinion regarding water for irrigation from 1879 to 1896, inclusive. It is fairly accurate.

Year.	Remarks.
1879....	High water in Rio Grande; scarcity in other streams.
1880....	Surplus water in Rio Grande; plenty in other streams.
1881....	Do.
1882....	Do.
1883....	Do.
1884....	High water in Rio Grande; plenty in other streams.
1885....	Surplus water in Rio Grande; plenty in other streams. Very heavy snows covered the valley in winter of 1885-86.
1886....	Surplus water in Rio Grande and other streams.
1887....	Sufficient water in Rio Grande and other streams.
1888....	Do.
1889....	Do.
1890....	Shortage all over valley and other streams.
1891....	Do.
1892....	Do.
1893....	Do.
1894....	Great scarcity all over the valley.
1895....	Very short until after the middle of July excessive rains produced high water in all of the streams until late fall.
1896....	Very great scarcity all over the valley; commenced closing down ditches on Rio Grande. June 7 low-water mark (at Del Norte) 240 second-feet.

This statement agrees fairly well with the other data I have and was made my basis for assuming the amount of water to charge to each acre in the different years, as stated in detail in the discussion of each district.

After thus making up a summary for the different sheets of each district the totals from each are collected onto the three sheets headed "Summary of use of water in San Luis Valley, Colorado."

In looking over these sheets you will notice that with the exception of districts 24 and 25 no new ditches appear after the decrees were granted. The returns for district 21 give the names of four ditches without decrees, but no data as to land irrigated, and so I could not include them in the statement for that district. Judging from their names they are all Mexican ditches and probably small affairs which may have been built and in use long before the decree was issued, but whose owners failed to appear in court. It is likely that their aggregate use of water forms but a small percentage of the whole use in the district. The decree of 1896 for district 20, instead of adding any ditches to the former decree, omits the last six given decrees in 1891. These were either granted decrees conditional on their being built, or after being built were abandoned. This indicates no new construction work in district 20 since 1891. In district 22 I am quite sure that no new ditches have been built since 1890, and from my knowledge of districts 26 and 27 I should say that it is not likely any new ditches have been built in recent years, as those in existence when the decrees were made largely overappropriated the available water.

VI. DISTRICT NO. 20, COLORADO.

Area, about 2,500 square miles.
Adjudicated, November 11, 1891.
Number of ditches, 206, shown on eleven sheets.
Number of separate decrees, 423.
Summation of decrees, 5,561.76 second-feet.
Capacity of ditches, 6,034 second-feet (actual).

District No. 20 is the most important one in the San Luis Valley, as it includes about one-half of the irrigated land in the valley and has within its boundaries several of the largest irrigation canals in the United States. It consists of the immediate drainage of the Rio Grande above the mouth of the Conejos and includes not only the main river, but all the numerous small creeks as well which lie between La Garita Creek drainage on the north and Alamosa Creek drainage on the south. Several of these, at San Francisco Creek, Rock Creek, and Cat Creek, never deliver any water to the main river except in seasons of heavy spring floods. Exhibit B¹ shows the eastern portion of this district and the location of its larger ditches.

On the head waters of the Rio Grande, as well as along the small tributaries, are little valleys which have been occupied as hay ranches for over twenty years. The decrees date back to 1873 and 1874, a few going back as far as 1867.

On passing Del Norte the river enters the main valley, and the elevation of its channel is such that canals leaving the river there run almost due north and south. After passing Alamosa the river, whose course so far has been easterly, swings to the south.

The earliest settlements in the district were made in 1866 by Mexicans, who located below Alamosa, on some low bottom lands along the main river. Up to about 1881 all the ditches built were small ones, although in that year nearly 200 of them were in use in the district. Then came a boom in irrigation development, and several very large canals were constructed in the next six or eight years.

Judging from the dates given in the decree, the first large canal to be started was the Rio Grande (No. 198 of the list), first called the Del Norte. Its first appropriation dates back to 1882, although I do not think that the main part of the canal was built until 1886 or 1887. Leaving the main river just above Del Norte, it skirts the foothills until the valley is reached and then turns north and extends across district 27 to Saguache, in district 26. The returns for 1896 state that it can water 60,000 acres. Its capacity of 1,500 second-feet is sufficient to serve twice that area.

The Monte Vista Canal, No. 204 (formerly called the Citizens' Canal), also has an appropriation dating from 1882, but the main canal was not built until later. It leaves the river above Monte Vista and runs south across district 21, finally tailing into the Conejos in district 22. Its claimed available area is 45,000 acres. Its capacity of 650 second-feet is fully sufficient for this amount.

The Empire Canal, No. 214, comes next in the list of large canals. Its first decree runs from 1883, but the main work of construction was not done until 1887 or 1888. Leaving the Rio Grande near Monte Vista, it runs southerly across district 21 into district 22. The returns assign it an available area of 50,000 acres. Its capacity of 1,000

¹ Public document.

second-foot is large enough to serve much more than this amount of land.

The Farmers' Union, No. 254, heads some 3 miles below Del Norte and runs north and northeast. It was built in 1888 or 1889, its first decree being dated November 7, 1887. (First use given in table as 1888.) The returns assign it 60,000 acres, but only give it a capacity of 325 second-feet. I have retained this size in the tabulation, although I am quite sure it was built to carry 800 feet or more. It has probably been neglected and filled up with sand blown in by the wind, as the waters of the San Luis Valley carry no silt, and so it could not have lost its original carrying capacity from the deposit of mud.

You will see that these four canals have an aggregate capacity of 3,475 second-foot or more, and there are several other ditches, each having a capacity of 100 second-foot or more. As the mean summer flow of the Rio Grande at Del Norte is less than 1,500 second-feet, while its minimum goes down during the irrigation season below 250 second-feet, it is easy to see that these canals stand but little chance of getting water for any large portion of the arable land covered by them. At the time they were built, however, there had been two or three successive years of heavy snowfall, and the river was carrying each summer much water beyond that used by the existing ditches. It was known even then that there was not a water supply sufficient for all of the projected canals, but the manager of each of the rival construction companies pushed the completion of his canals, hoping to obtain by some means a right to all the water, thus leaving his rivals with none.

A good many immigrants settled under the large canals immediately after their construction, and the ditch owners also farmed on a large scale for two or three years, about 1891 and 1892. It is stated that the Empire watered 75,000 acres in 1892. I have estimated 40,000 served for that year. In the returns for 1896 it is credited with serving but 7,450 acres. Some 50,000 acres were watered in 1892 by the canals north of Alamosa, where the area tilled in 1896 was small.

About 1892 the canal companies got into financial difficulties and internal dissensions and the bonanza farming was abandoned. The residents of the valley say that more land is tilled now than in 1892, but I do not quite credit the statement. While there are probably more resident farmers than in 1892, each on 80 or 160 acres of land, it takes a large number of them to farm 40,000 acres, as did the owners of the Empire.

District 20 was first adjudicated in 1891, but readjudicated in the winter of 1895-96. My work, as before stated, is based on the first decree. The new decree gives appropriations aggregating only about 2,660 second-feet against an award made by the first decree of over 5,560 second-feet. The first adjudication named 272 ditches. Of these, the second decree omits 12, 6 being noted as having water rights in the Rio Grande Canal and the last 6 of the first decree being dropped. I have retained in my list the first 6, but have assigned them no acreage, thinking their watered area would be returned with that of the Rio Grande Canal. The last 6 I have omitted from my list. They were probably never built or, if built, abandoned. The sum of their decrees was only 12.30 second-feet, so that their omission or insertion cuts no material figure in the totals. The return for 1895 from district 20 was very meager, only giving data relating to 16 of the incorporated ditches.

For 1896 the return is more complete. It gives data for all the

ditches on the Rio Grande below Del Norte with the exception of the Prairie No. 249, and gives the average flow of the tributaries, together with the acreage watered on each, all of the flow returned having been used for irrigation. I have entered on the eleven detail sheets of this district the returns for 1896, distributing among the ditches on each branch stream the total returned acreage thereon in proportion to the size of their decrees. There were then a few small ditches without any return, and I assigned an assumed acreage, based on the decree of 1896, thinking that the latter was more likely to indicate the acreage now watered than was the decree of 1891. The number and size, however, of the ditches on which no return is made is small, the whole area filled in by assumption as above described forming only about 2 per cent of the total area watered in the district. This is aside from the Prairie, which, although in use, was by some oversight omitted from the returns. For it I assumed 5,500 acres, basing the assumption on the decree for 1896.

Wherever the returns charged more than 4 acre-feet of water to an acre of land I reduced them to that amount in accordance with the plan and for the reasons before outlined. Only 34 out of the 266 ditches were over charged. When these reductions are made, the average for the whole district is some 1.85 feet of water used per acre of land irrigated in 1896.

The returns for 1895 give a total acreage for 16 of the larger ditches, which is 20 per cent greater than the returns for the same ditches in 1896. In assigning acreage for the other ditches for 1895, however, I added but 10 per cent to the area of those ditches for 1896, thinking that the amount of land watered under the smaller ditches was not so likely to change as under the larger ones. In this way the acreage for 1895 was made up.

Prior to 1895 I assumed that the areas under each ditch would be the same as that of 1895 until some of its decrees lapsed, except in the cases of 9 of the larger ditches. I had assigned to the Prairie 5,500 acres for 1895 and 1896. This I carried to 1892, but gave it 4,500 in 1891 and 3,500 in 1890. To the Excelsior, Rio Grande, Monte Vista, Empire, San Luis Valley, Costilla, Farmers' Union, and Kenelworth, I assigned the areas given in the table on the last sheet of the summary for district 20, this table being made up from average of information obtained in various places.

From 1892 back the area of each ditch was reduced in the proportion of its lapsing decrees, as before fully explained.

The return for 1895 charges to the 16 ditches returned a total of 835,330 acre-feet of water used on 126,540 acres, or an average of 6.6 acre-feet per acre. The other ditches on the Rio Grande below Del Norte gauging station watered about 22,000 acres in 1895. If these were charged with the same proportionate use of water as were the others, the total charge for 1895 would be 970,000 acre-feet. As the total recorded flow of the Rio Grande past the Del Norte gauging station from April 1 to September 30, 1895, was but 545,000 acre-feet, it is evident that no dependence is to be placed on these returns so far as they relate to the amount of water used, although the acreage is probably fairly reliable.

After studying the table of gauging at Del Norte, to be described later on in this report, and Mr. Anderson's statement, I have assumed the following use of water in district No. 20:

Up to 1887, inclusive, 4 acre-feet per acre.

Up to 1888 and 1889, 3.5 acre-feet per acre.

Up to 1890 and 1891, 3 acre-feet per acre.

Up to 1892 and 1893, 3 acre-feet per acre for first 150 ditches; 2 acre-feet per acre for the rest.

Up to 1894, 3 acre-feet per acre for first 150 ditches; 1.6 acre-feet per acre for the rest.

Up to 1895, 3 acre-feet per acre for first 150 ditches; 2.3 acre-feet per acre for the rest.

For 1896 the returns show 3 acre-feet per acre for the first 150 ditches; 1.65 acre-feet per acre for the rest.

The first 150 ditches are all small, watering but about 15 per cent of the total area served in the district. The detailed returns for 1896 give them, as above stated, an average of 3 acre-feet per acre, and as this is the driest year on record, I thought best to give them the same all the time since any shortage commenced to be felt in the district. For the others, the amount is determined in a measure from the gaugings at Del Norte, remembering that all the water of the six months between April 1 and September 30 can not be used, as some comes before and some after the irrigation season and some comes also in the spring flood, when it is not at all probable that the whole flow of the river would be used. The totals for the district are entered, sheet by sheet, on the "Summary, district 20," and also in the "Summary for Colorado."

The capacities given are furnished me by Mr. Anderson and are intended to be actual. They are probably close approximations thereto.

VII. DISTRICT NO. 21, COLORADO.

Area, about 550 square miles.

Adjudicated, July 11, 1888.

Number of ditches, 75, shown on three sheets.

Number of separate decrees, 91.

Summation of decrees, 1,877.67 second-feet.

Capacity of ditches, 799 second-feet (actual).

District No. 21 comprises the drainage of Rios La Jara and Alamosa, including that of Hot Creek. The streams all flow at first through long, deep cañons, widening occasionally into little valleys. The first settlements were made in these valleys. About the mouth of Hot Creek the two rivers, there close together, enter the level valley and then run easterly to the Rio Grande nearly parallel and only 1 to 2 miles apart. Only in flood time does the water of either river reach the main stream or even enter the valley. Nearly all is used up on the little valleys of the cañons and a high mesa between Hot Creek and the Alamosa, watered from the latter, and what escapes the ditches sinks into the ground and probably goes to the supply of the shoal La Jara artesian basin, for around the town of La Jara flowing wells, with light pressure, are obtained at a depth of from 30 to 50 feet.

The Empire Canal extends into the eastern portion of district 21, and during 1891 and 1892 watered many thousand acres therein. This land is included in the estimate of acreage in district 20.

The Monte Vista (formerly called the Citizen's) Canal, crosses this district just under the toe of the foothills, but does not, I understand, water any land in the district.

The returns from this district are complete for both 1895 and 1896. The capacities given are actual, and not those shown in the decree. As would be anticipated from the description of the district and from

the fact that 1895 was a year of good water supply after the middle of July, the returns for that year charge more than 4 acre-feet of water per acre to a large number of the ditches, or to 40 out of the total of 75. But the acreage under these ditches was small compared with that served by the other 35, so that, after reducing all excess charges to 4 acre-feet per acre, the average for the district amounts to 2.6 feet per acre. This is to be expected, as there is said to be a shortage always in the district, as there is much more good land under ditch than the water will supply.

The returns for 1896 give an excess of water in 13 ditches, all small affairs. When these are reduced to 4 acre-feet per acre the average for the district is 0.7 acre-feet per acre. The area watered in 1895 was about 3,500 acres more than in 1896. The returns for 1896 give, as before mentioned, the names of five ditches without decrees, but no statements of areas watered. Their names are: J. A. Ortiz, El Chamiso, Damien Nunez, Ramon Domingo, Frank de Herera. They are probably small affairs and cut no material figure in the totals.

The greatest acreage of the district was probably in 1891. I assumed for the year an increase of about 10 per cent over 1895, and for 1889 about the same as for 1895, making the assumed acreage the following for the years after the decree:

	Acres.		Acres.
1888	42,000	1892	45,000
1889	42,000	1893	44,000
1890	44,000	1894	42,000
1891	46,000		

The decrease of acreage in this district from 1891 to 1896 was probably due to the short water supply of the intervening years. As the supply is normally short in this district, any diminution thereof would be more quickly felt than in the other districts.

Prior to 1885 the acreage in the district was small and principally grass land, so I assumed 4 acre-feet used on each acre watered prior to 1885, including that year. In 1886 acreage was increasing, and I assumed 3.5 acre-feet per acre. In 1887, 1888, and 1889 there was a sufficient water supply in the valley as a whole, but the acreage in district 21 was increasing quite rapidly and the water supply was fully appropriated. I therefore assumed for those years 3 acre-feet of water used per acre irrigated. From 1890 to 1893, inclusive, the supply of water was short, and the amount used here is assumed to be 2 feet per acre. In 1894, when it was very short, the assumption was 1.5 acre-feet per acre. The returns show 2.6 acre-feet per acre for 1895, and 0.7 for 1896, as before stated.

Prior to the decree given in 1888 the same method was employed to obtain acreage as was used in district 20. From the acreage thus obtained and the above assumptions as to use of water the "Summary district 21" was made up from the three sheets and the totals carried from it to the summary for Colorado.

VIII. DISTRICT NO. 22, COLORADO.

Area, about 550 square miles.

Adjudicated, 1890.

Number of ditches listed, 110 shown on five sheets.

(The 3 Taos Valley canals are rejected from the totals for reasons fully given further on, leaving 107 ditches carried to the summary.)

Number of separate decrees, 142.

Summation of decrees, 2,978.42 second-feet.

Capacity of ditches, 1,034 second-feet (actual).

District No. 22 comprises the drainage of the Conejos and its tributaries. As in district 21, the streams all flow at first in long, deep cañons, widening to occasional valleys and meadows, and in these, and on the edge of the main valley near Conejos, are the oldest ditches in the district.

The San Antonio, the largest tributary of the Conejos, has its source in New Mexico, and Los Pinos Creek, while rising in Colorado, flows through New Mexico in a portion of its course. There are small ditches on both of these streams in New Mexico. They are included in the list of ditches for that Territory.

Exhibit C¹ is a large scale map of a portion of district 22, issued by the State engineer of Colorado, on which are shown the larger ditches. You will see that the Citizens' (now called Monte Vista) Canal runs to the Conejos, as before mentioned. It is my belief, however, that no land in the district was ever watered from it.

In 1888-89 a company named the Taos Valley Irrigation Company constructed in this district three large canals known as Taos Valley canals Nos. 1, 2, and 3, each with an original carrying capacity of over 500 second-feet. No. 1 was built for the purpose of diverting water from the Conejos to the San Antonio River, reaching the latter stream about a mile south of Antonito. Here a dam was thrown across the river, and canal No. 2, heading at the south end of the dam, was built through the solid lava rock to the State line, reaching it some 5 miles southeast of the dam. Canal No. 3 also headed in the San Antonio several miles below the head of No. 2, and ran to the southeast. It was the intention of the promoters to water a large body of land in New Mexico, but they found that in order to reach the land their canals would have to be dug through solid rock for many miles, that only a small percentage of the area they would cover was arable, and that the water rights granted them in the decree of 1890, while making the grand showing on paper of 500 second-feet for each canal, or 1,500 second-feet in all, were valueless, as all of the mean flow of the two rivers was absorbed by prior appropriations.

The original promoters therefore dropped the scheme and the bondholders took hold. The latter built a reservoir under canal No. 3, called Cove Lake, whose capacity is said to be some 9,700 acre-feet. When they got it built, however, they discovered that there was only a thousand acres or so of arable land commanded by it. This land they have attempted to colonize, but so far have failed, and I infer from a conversation I had with their manager in Antonito that they are about to abandon the project. No land has ever been watered by these three canals, although canal No. 2 ran full during the spring flood for several years. The water was turned loose at its lower end onto the mesa and found its way into the cañon of the Rio Grande somewhere below the Colorado line. On account of these conditions I have thought it best to omit these three canals from the totals while giving them in the list of ditches for this district, because I considered that including them would be confusing. So, while the list gives the names of 110 ditches, the totals show but 107 with their respective capacity and decree in district No. 22.

Mr. John C. Dalton, the commissioner of this district, gave me the capacities of all the ditches. He has been commissioner for four years and is very familiar with the district; so that although there are no rating flumes in the ditches, nor have any of them been care-

¹ Public document.

fully measured, the capacities given are no doubt near approximations to the true capacities. It is in this district that the actual capacities amount to 1,034 second-feet, the decree to 2,978.42 second-feet, and the claimed capacities to about 4,000 second-feet, all of these totals exclusive of the Taos Valley canals.

The returns for 1896 give an aggregate of 60,625 acres watered during the year, and surplus water for 19 of the 107 ditches returned. When these are reduced to 4 acre-feet per acre, however, the average for the whole district is but 1.75 acre-feet per acre.

Mr. Dalton stated that to the best of his recollection about 40,000 acres were watered in 1893, 46,000 in 1894, and 51,000 in 1895. I am inclined to the belief that his figures are small, as he is a conservative man.

From all I can learn, I judge that the acreage of 1890, the year of the decree, was about that of 1896, and so have assumed the following acreages for the respective years:

	Acres.		Acres.
1890.....	60,000	1893.....	45,000
1891.....	55,000	1894.....	50,000
1892.....	50,000	1895.....	55,000

Back of 1890 the acreage is computed by the lapsing of the decrees, as in districts 20 and 21.

This district has generally had a very good water supply, so prior to 1890 I assumed 4 acre-feet per acre. As there was a shortage in the entire valley in 1890, 1891, 1892, and 1893, I assumed 3 acre-feet used on each acre in district 22. In 1894, when the drought was more severe, I assumed 2.5 acre-feet per acre, and in 1895 3 acre-feet per acre. In the last-named year there was an abundance of water after July 15, and the grass lands would have used the full amount of 4 acre-feet per acre, but the large Mormon population around Manassa and Ephraim raise principally wheat and oats, and this water came too late in the season for them, so that I assume an average for the district of 3 feet per acre.

With these assumptions are made up the two sheets headed "Summary district 22," and the totals are carried therefrom to the summary for Colorado.

IX. DISTRICT NO. 24, COLORADO.

Area, about 700 square miles.

Adjudicated June 14, 1889.

Number of ditches listed, 25, shown on one sheet.

Number of separate decrees, 23 (two ditches have no decrees).

Summation of decrees, 265.50 second-feet.

Capacity of ditches, 356 second-feet.

Districts No. 24 and 35 lie entirely within the Sangre de Cristo Spanish grant. That portion of this grant included in district No. 24, together with a large area in New Mexico, is known as the Costilla estate, while the portion which forms district 35 is called the Trinchera estate.

District No. 24 covers the drainage of Rio Culebra and that portion of the Rio Costilla drainage lying in Colorado. Its surface outside of the mountains is more uneven than is that of the rest of the valley, the San Luis hills and San Pedro mesa breaking up the western portion.

The returns for 1896 give the actual capacities of the ditches, not

those mentioned in the decree. The total acreage returned in 1896 is 7,050 acres, while the returns for 1895 show 9,500 acres watered. I assumed that nearly the maximum acreage was watered in 1895, or that the maximum was 10,000 acres.

There are 25 ditches in the district, 23 having decrees. Two were built on the Costilla after the decree was given.

The returns for 1896 give an excess of water used in 20 out of the 25 ditches, but when these are reduced to 4 acre-feet per acre the average for the district is 3.2 acre-feet per acre. While all the water in the district is now appropriated and in dry years practically all is now used, the supply is very steady and uniform, as all the streams have their sources high up on the Sangre de Cristo Mountains (here called Culebra Range). So that, while the years 1890, 1891, 1892, 1893, and 1894 were years of scanty water supply for the valley in general, I assumed the following use of water in this district: 1890, 4 acre-feet per acre; 1891 and 1892, 3.5 acre-feet per acre; 1893 and 1894, 3 acre-feet per acre.

In 1895 I assumed 4 acre-feet per acre, and prior to 1890 4 acre-feet per acre also.

As there was but one sheet of the list of ditches for this district, there is no summary sheet, but the totals are entered directly in the summary for Colorado.

X. DISTRICT NO. 25, COLORADO.

Area, about 950 square miles.

Adjudicated March 28, 1890.

Number of ditches listed, 171 on seven sheets.

Number of separate decrees, 235.

Summation of decrees, 919.18 second-feet.

Capacity of ditches, 2,501 second-feet (from decree).

District No. 25 covers the whole western slope of the Sangre de Cristo Range north of Sierra Blanca, its western boundary being San Luis Creek on the southern half and the divide between it and the Saguache on the northern half. There are no large streams or ditches in the district, but its water is carried in many small creeks. As a result the number of ditches is large in proportion to the area watered. The Luis Maria Baca Spanish grant No. 4 occupies about 150 square miles of the best portion of the district and has on it some 28 small ditches.

No water from either district 25 nor from 26 or 27 ever reaches the Rio Grande on the surface. Near the south end of the district, on the line between it and district 20, you will notice on Exhibits A and B¹ several small lakes. These are called the San Luis Lakes. The larger is about 2½ miles long, with an area of about 1,500 acres. The smaller ones have areas of from 100 to 300 acres each, the total area of all being somewhere between 2,500 and 3,500 acres. These lakes receive the flood waters of districts 25, 26, and 27. Sometimes the surplus waters of seasons of heavy snowfall will raise the lakes 3 feet. But no one that I could find has ever seen water run from these into the Rio Grande.

All of the streams in these three districts begin to decrease in size on reaching the open plain, their waters apparently sinking into the gravelly substratum of the plain and probably furnish the water for the deep artesian basin which is tapped by a large well at Alamosa.

¹Public documents.

The returns from this district are complete for both 1895 and 1896, but I doubt their accuracy for either year. In both years each ditch is charged with carrying its full decree for the season, which is given as from fifty to one hundred and twenty days in 1895, but is averaged for the whole district as sixty-five days in 1896. After reducing the excess returns for 1895 to 4 acre-feet per acre, the total gives 3.77 acre-feet per acre used that year. This is likely to be something near the correct amount. In 1896, however, the returns give over 2.5 acre-feet per acre, and this I believe to be largely in excess of the amount used. I have no means of correcting it, however, and so must let it go as it is.

The returns for 1895 give 1,515 acres watered by ditches without decrees, and for 1896 1,625 acres, but no statement as to the number or capacity of the ditches serving this land. Whatever their number, it is likely that they were built soon after the decree was given in 1890, as the dry years of 1891, 1892, 1893, and 1894 would discourage the construction of new ditches. In 1896 there was a little over 3,000 acres more cultivated than in 1895, and the acreage for 1896 would just about equal the amount the decree was supposed to cover, which, at 50 acres per second-foot, would be about 46,000 acres for the decree of 919.18 second-feet. I therefore made the following assumptions as to acreage:

Prior to 1890, and 1890, assume full decree cultivated, decreasing the amount as the decrees lapse; 1891, assume 800 acres more than decree, this for new ditches; 1892, assume 1,600 acres more than decree, this for new ditches; 1893, assume decree; 1894, assume 1,500 acres less than the decree.

While the district receives its water supply from the western slope of the Sangre de Cristo Mountains, the same as does district 24, the water is all carried in small streams, and so the shortage of the years after 1890 was probably felt more severely here than in district No. 24. I therefore assumed the following use of water:

For 1889 and prior thereto, 4 acre-feet of water per acre; for 1890, 1891, 1892, and 1893, 3 acre-feet of water per acre; for 1894, 2.5 acre-feet of water per acre.

From these assumptions the three sheets, marked "Summary district No. 25," were made up, remembering that sheet No. 7 of the list must carry, in excess of the amount due from its decrees, the several amounts allowed for ditches without decrees, viz, 800 acres in 1891; 1,600 acres in 1892, 1893, and 1894; 1,515 acres in 1895, and 1,625 acres in 1896. The totals were carried to the summary for Colorado.

In this district the water commissioner returned the capacity of ditches mentioned in the decree, summing 2,456 second-feet for the 171 ditches besides 45 second-feet allowed the ditches without decrees. There is no probability that the total capacity of ditches in this district exceeds or even equals the decree, viz, 919 second-feet.

XI. DISTRICT NO. 26, COLORADO.

Area, about 900 square miles.

Adjudicated November 23, 1889.

Number of ditches listed, 184 on eight sheets.

Number of separate decrees, 207.

Summation of decrees, 561.76 second-feet.

Capacity of ditches, 1,509 second-feet (from decree).

District No. 26 covers the drainage of Saguache River and its tributaries. Fully three-fourths of the land watered is hay land and pasture

land. All of the ordinary flow of the drainage is appropriated, and has been for many years. Of the 184 ditches granted decrees, 161 were built prior to 1885, and all prior to 1888. The flood waters of the Saguache, on passing into the main valley, spread out into marshes and sink away, but very little ever going as far south as the San Luis lakes. The irrigated area is made up of many small farms, each having its own ditch, so that the average area served by each ditch is only about 25 acres.

The return for 1895 is incomplete, while that for 1896 gives the names of the owners of the ditches instead of the names under which the decrees were granted, so that it was impossible for me to identify all of the ditches named in the return. The number of ditches returned corresponds fairly well with the number given in the decree. I identified as many as possible, and then added to the total return for those identified the balance of the return to obtain the total for the district.

The return for 1896 gives 20,205 acres irrigated, while the amount given in 1895 is 16,850 acres. It is likely that the preceding four dry years had discouraged the farmers, and so less acreage was cultivated in 1895, but the copious rains of that summer encouraged them to expand again in 1896. As the returns can not be completely identified either for 1895 or for 1896, the only course open for me is to proportion among the several ditches the total acreage according to the size of their decrees. The acreage for 1895 gives 30 acres per second-foot of decree, and that of 1896 gives 36 acres per second-foot, the total decree being 562 second-feet. While this decree was based on 50 acres for each second-foot, it is not likely that the average amount ever exceeded 40 acres. This I have assumed as the condition in 1889 and 1890, the years of probable maximum for this district, or, there being 562 second-feet of decree, an acreage of 22,500 for those years. I proportioned the decrease from 1890 to 1895 among the different years. Prior to 1889 the acreage is deduced from the decrees, as in the other districts.

The water in this district is overappropriated, as is shown from the returns for 1896, charging an average of but 0.8 acre-foot of water to each acre irrigated. Prior to 1880 the acreage was about three-fourths of the amount now cultivated. It is likely that even then the water supply was scanty. I assumed 3 acre-feet per acre for all years shown in the summary up to and including 1889. For 1890, 1891, 1892, and 1893, 2 acre-feet is assumed, and for 1894, 1.5, acre-feet, this being the driest year prior to 1896. In 1895 I could not identify the returns, and so assumed 3 acre-feet per acre.

From these assumptions is made up the summary by sheets for this district and the totals are carried to the summary for Colorado.

The return from this district gave no capacities, and I estimated the capacities indicated by the sizes mentioned in the decree. While these total 1,509 second-feet for the district, it is not likely that the total capacity of the ditches exceeds or even equals the decree, viz, 562 second-feet.

The return shows no ditches without decrees, and it is not likely that any exist.

XII. DISTRICT NO. 27, COLORADO.

Area, about 350 square miles.

Adjudicated February 23, 1890.

Number of ditches listed, 49 on two sheets.

Number of separate decrees, 51.

Summation of decrees, 47.42 second-feet.

Capacity of ditches, 173 second-feet (taken from decree).

District No. 27 covers the drainage of Carnero and La Garita creeks. It is a small and unimportant section. The irrigation is old, all dating back to 1880.

The returns for 1895 give a total acreage of 4,040, over 3,000 acres of which is natural grass, while those for 1896 give but 2,670. No explanation for this sudden and large decrease of area is given. The only assumption for acreage prior to 1895 that I can reasonably make is that 4,000 acres, including pasture land, have been watered each year prior to 1895, and this is done in the total summary sheet. This assumption, however, gives an average of about 90 acres of land watered by each second-foot of decree. The only explanation of this large acreage I can offer is, that pasture lands are not included in the decree, but are actually watered when there is a sufficient supply and are included in the returns as natural grass. When water is short, as in 1896, they are not watered. This would also account for the sudden decrease in 1896.

The returns for 1896 show 2.6 acre-feet of water used per acre. This is distributed uniformly among the ditches. The returns for 1895 are in such shape that the different ditches can not be identified, nor can I compute the total amount of water used. As there seems to be a good supply for the land watered, I assumed 4 acre-feet per acre up to and including 1889, 3 acre-feet per acre for 1890, 1891, 1892, and 1893, 2.5 acre-feet per acre for 1894, and 4 acre-feet per acre for 1895. While the amount per acre assumed for 1894 is less than that used per acre in 1896, the acreage for the former year is assumed to be much greater than was that for 1896, so that the total amount of water used in 1894 is considerably more than the returns show for 1896.

The capacities given are taken from the decree, and are not reliable.

XIII. DISTRICT NO. 35, COLORADO.

Area, about 500 square miles.

Not adjudicated.

Number of ditches listed, 48 on two sheets.

Capacity of ditches, 346 second-feet (actual).

District No. 35 includes the drainage of Sangre de Cristo and Trinchera creeks, and covers that portion of the Sangre de Cristo grant which is known as the Trinchera estate.

While irrigation is old in this district, some of it dating back to 1855, the courts have not yet adjudicated it, and there is no water commissioner in the district. Mr. Flores and I spent a day at and near Garland, and gathered the data from which the table is made up. In it the ditches are arranged according to their position on the drainage, working from the head of the stream downward instead of chronologically, as in the other Colorado districts. I did this because I was not sure as to the date of construction of many of the ditches in district 35, and did not wish to make up a list which might do injustice to some of them.

The water supply of this district is small, not being enough to water one-tenth of the available land. With two exceptions the ditches are small and each waters but one man's land. In 1888 two large canals were built, one heading on Trinchera Creek and one on Sangre de Cristo Creek. Each claims an appropriation of 212 second-feet, and each will now carry 100 second-feet; but there is practically no water for either one, and the amount of land served is small.

In 1896 the total amount of land watered in the district was 4,180 acres, and in 1895, 4,430 acres. From 1889 to 1894 the two large canals above mentioned watered a little more land than was served afterwards, so that the total for those years is given as 4,780 acres. Prior to 1889 the amounts watered by the ditches said to have been built a certain year are deducted from the total for that year to obtain the acreage for the preceding year.

The amount of water used is assumed to be 4 acre-feet per acre prior to 1890, 3 acre-feet per acre for 1890, 1891, 1892, and 1893, and 2.5 acre-feet per acre for 1894. For 1895 and 1896 the amount varies with the different ditches, as given in the table.

It is probable that, while this district is not organized and we have no record of decrees carried out to the hundredths of a second-foot, the returns here given are fully as reliable as those from the other Colorado districts.

With the assumptions above given, the summary for the district was made up and the totals transferred to the summary for Colorado.

XIV. RÉSUMÉ OF COLORADO STATISTICS.

This completes the detailed description of the Colorado irrigation in the Rio Grande drainage. The total number of ditches listed (see last sheet of summary for Colorado) is 925, with a stated capacity of over 12,700 second-feet and a probable actual capacity of about 10,000 second-feet. Of these, 877 are authorized by law to divert over 12,200 second-feet of water. Their owners claim that 635,000 acres of land are "under ditch," or that the ditches can now serve that amount. The maximum area watered in the valley was in 1892, when some 400,000 acres were served. This dropped to 340,000 acres in 1895 and 320,000 in 1896, but will probably increase slowly hereafter, although the maximum above given is not likely to be reached again unless storage reservoirs are built, for the land now irrigated demands the full water supply of the valley. I will discuss the reservoir problem before closing this report.

It is likely that the total acreage given in these tables is within 10 per cent of the amount cultivated during 1895 and 1896. The aggregate statement of amount of water used during those years is probably within 15 or 20 per cent. Prior to 1895, however, the statements of the acreage may not be nearer than 15 per cent, and the statement of water may not be nearer than 25 per cent, or possibly 30 per cent, to the actual quantities in each case. I think that these percentages of error in the totals are maxima, as a large error one way on one ditch or in one district may be balanced by an error the other way in another district.

Owing to the method adopted by stopping acreage when a decree stops, before explained, the acreage is sure to be large enough each year prior to about 1889, as a ditch very seldom waters its full amount of land the first year of its construction, while the supposition on which the acreage was handled is that the ditch does do this.

Before discussing the significance of the totals for Colorado and the probable effect on the river of the increased use of water since 1880 in the San Luis Valley, I will describe the New Mexico data and give all the available information concerning the flow of the Rio Grande, so that you may have all the facts in view before any attempt is made at reaching conclusions.

DISTRIBUTION OF WATERS OF THE RIO GRANDE.

Following you will find a tabulated statement of the allowances of water made for the several years in the various districts of the San Luis. All this information is given under the discussions above, but is collected here for convenience of reference. The quantities are in acre-feet of water charged to each acre each year and for each district mentioned.

Estimated use of water—San Luis Valley, Colorado.

Year.	District.							
	20.	21.	22.	23.	25.	26.	27.	35.
Before 1880.....	4	4	4	4	4	3	4	4
1880.....	4	4	4	4	4	3	4	4
1881.....	4	4	4	4	4	3	4	4
1882.....	4	4	4	4	4	3	4	4
1883.....	4	4	4	4	4	3	4	4
1884.....	4	4	4	4	4	3	4	4
1885.....	4	4	4	4	4	3	4	4
1886.....	4	3.5	4	4	4	3	4	4
1887.....	4	3	4	4	4	3	4	4
1888.....	3.5	3	4	4	4	3	4	4
1889.....	3.5	3	4	4	4	3	4	4
1890.....	3	2	3	4	3	2	3	3
1891.....	3	2	3	3.5	3	2	3	3
1892.....	3 for first 150 days; 2 for rest.	2	3	3.5	3	2	3	3
1893.....	3 for first 150 days; 2 for rest.	2	3	3	3	2	3	3
1894.....	3 for first 150 days; 1.5 for rest.	1.5	2.5	3	2.5	1.5	2.5	2.5
1895.....	3 for first 150 days; 2.3 for rest.	2.6	3	4	3.8	3	4	3.4
1896.....	3 for first 150 days; 1.65 for rest.	.7	1.75	3.2	2.56	.8	2.6	2.5

XV. IRRIGATION LAW AND PRACTICE IN NEW MEXICO.

New Mexico has no working irrigation law. I think that the last legislature passed a bill to regulate the use of water, but it has not been enforced. There is no Territorial engineer or other officer having control of the distribution of water. Whenever the owners of a ditch think that some acequia built after theirs, but higher up the stream, is diverting water which rightfully belongs to them, they can apply to the district court for an injunction restraining the owners of the later ditch from taking the water, and possibly, months after their crops are ruined, win their suit. The few rights of the Territory which have been adjudicated have gone through this process.

In the northern third of the Territory, where the waters are moderately free from silt, and hence very little work is needed to keep the ditches in working order, the only official of a community ditch organization is a mayor-domo, whose duty it is to distribute the water among the different claimants under the ditch.

Farther south, where the water carries much silt and the ditch requires frequent and extensive cleanings, the organization consists, in addition to the mayor-domo, of one or three commissioners. The latter roughly measure the land each man wishes to irrigate each year and assess him a certain amount of work each week on his holding, to be devoted to cleaning the ditch of sediment whenever such cleaning is necessary. The amount of the assessment varies with the location of the ditch and the amount of silt usually borne by the water, from a day's work per week for 5 to 8 acres of land watered in

the country just below the mouth of the Puerco to one for 15 or 20 acres above there.

There is no systematic attempt to distribute among the different ditches the water of any stream. So that on the Rio Grande, for instance, water may be lavishly used in the Espanola Valley and above Albuquerque at the same time that the crops farther down the stream are dying from drought. Whenever there is a prospect of shortage, the owners of each ditch take all the water they can possibly use, instead of trying to use water sparingly, and the people below, to whom no water is coming, watch their crops dying and say, "It is the will of God."

As before stated, fully 90 per cent of the farming in New Mexico is done by Mexicans, and they cultivate largely varying areas in different years. The areas given in the tables of New Mexico ditches are means, as near as I could judge, of the areas cultivated. A part of the commissioners along the Rio Grande ditches were able to give me statements of acreage which were pretty close, but where there were no commissioners it was difficult to learn the areas watered. Whatever land I saw I estimated as well as possible, and obtained from the inhabitants their estimates also as a check on mine.

In considering the information relating to New Mexico the method of obtaining it must be borne in mind and due allowance made for its probable error. I believe that the total area of irrigated land given for each district is within 15 per cent, and possibly within 10 per cent, of the area actually watered an average year. The statements as to total amount of water used, however, are not so close, because it is difficult to say how much water is used per acre. I should say that the latter statements are within 25 per cent of the true amount of water used. They show, however, relative amounts for the different years within what is likely to be a nearly constant percentage of approximation, and so will serve the purpose of determining the relative use of water each year since 1880. These remarks apply to the Colorado data as well.

That there have been years of scanty water supply between 1880 and 1896 I do not doubt. In a few cases I have been able to locate them for small areas, but not with sufficient certainty of the extent of the shortage to justify me, except in the case of the year 1889, in saying that there was a short water supply a certain year all over the Territory. The year 1889 was, I believe, however, a short year for the whole Territory except the Chama and northern New Mexico country. That season the Rio Grande was dry at El Paso for several months after July 15, showing that the usual summer rains of the Puerco and adjacent drainages did not come. In the whole Territory, except the extreme northern portion, partial dependence for water is placed on the summer rains. So I have in all districts, except 1, 2, and 3 (see description of districts farther on), where the snow water is the chief reliance, made a reduction in the estimate for 1889. Whenever I could definitely locate other dry years for any particular section of country, I have made the estimate of water used short for that section. Otherwise I have given a full allowance for each year.

XVI. WATER DISTRICTS OF NEW MEXICO.

For the purpose of this report I have divided the New Mexico drainage of the Rio Grande into seventeen districts, whose description and boundaries I will give in the detailed description of each one.

DISTRIBUTION OF WATERS OF THE RIO GRANDE.

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The assumed numbers, names, and drainage areas are about as follows, being outlined by red lines on Exhibit D:¹

No.	Name.	Approximate drainage area.
		<i>Sq. miles.</i>
1	San Antonio.....	250
2	Chama.....	3,300
3	Cerro Mesa.....	710
4	Taos Mesa.....	480
5	Embudo Creek.....	430
6	Santa Cruz.....	480
12	Espanola (Rio Grande).....	1,050
7	Santa Fe Creek.....	480
8	Galisteo.....	1,400
9	Jemez.....	900
13	Upper Albuquerque (Rio Grande).....	850
14	Lower Albuquerque (Rio Grande).....	940
10	Puerco.....	6,400
11	Salado to Berendo.....	5,500
15	Socorro (Rio Grande).....	800
16	Rincon (Rio Grande).....	600
17	Mesilla Valley (Rio Grande).....	150
	Add for unassigned territory west of river (no water).....	2,300
	Add for unassigned territory east of river (no water).....	4,000
	Total New Mexico drainage of the Rio Grande, as before.....	31,000

These will be considered in the order of the numbers, although here arranged geographically. The system of numbering used is adopted so as to place the study of the Rio Grande valleys together.

The tables showing the ditches in each district are made up with thirteen columns, headed and filled in as follows:

1. "Number of ditches," being the number of ditches described on each line. As there were many groups of small ditches which could readily be described in a body, I have thought best to do this in order to keep the lists as short as possible. This first column is simply to facilitate getting the total ditches described on each sheet.

2. "Number on stream," calling the ditch highest up on each stream No. 1, and numbering downstream.

3. "Name." Where a ditch has no specific name I have marked it "Private." It is a general rule that where a ditch serves two or more farms it has a special name, while many serving but one farm have also names; so that it is safe to assume that all those marked "Private" serve but one farm.

4. "Stream," being the source of water supply.

5. "When built." Whenever possible, I obtained the date of construction of each ditch listed, but when I could not obtain that I traced the existence of a ditch back as far as possible, and then entered it as built before the earliest date at which I satisfied myself it was in use.

6. "Approximate location of head," given in Land Office terms as follows: The surveys of the public lands of New Mexico are based on an initial point at San Acacio, on the Rio Grande, about 10 miles below the mouth of the Puerco. Through this initial a meridian was run due north and south and a base line due east and west. The country was then cut into townships 6 miles square and these into sections 1 mile square. These townships are numbered north and south and east and west from the initial point, the number of the townships north or south being called townships (usually abbreviated

¹ Public document.

to T. or Tp.) and the number east or west being called ranges (usually abbreviated to R.). Thus T. 32 N., R. 5 E., would indicate that particular township whose northeast corner was 32 by 6 (192 miles) north and 5 by 6 (30 miles) east of the initial point. The sections are numbered in the usual way, No. 1 being in the northeast corner of the township, 6 in the northwest, and the numbers running back and forth across the township, ending with section 36 in the southeast corner. In column 6 is entered the section, township, and range in which is located the head of each ditch, this location being generally taken from a map. These locations are not exact, but are definite enough to locate and identify the portion of a drainage under consideration.

7. "Capacity." Being the estimated carrying capacity of each ditch in cubic feet of water per second.

8. "Total capacity." This column is put in to facilitate the addition of capacity on each sheet, as on nearly every one there will be some entries of several ditches on one line which have the average capacity of each entered in column 7, and an attempt to sum column 7 is confusing.

9. "Acres irrigated." Being the mean area, unless otherwise stated.

10, 11, 12. "Acre-feet of water used in 1894-1896." See explanation below.

13. "Remarks," which are self-explanatory.

In figuring the amount of water used, I have in no case allowed over 4 acre-feet per acre, as I believe this to be the maximum amount used in New Mexico, as well as in Colorado. I have allowed this freely, however, even on grain land, whenever there is a good water supply, unless the surroundings were such as to point conclusively to a smaller use of water. It is not likely that over 2 feet is ever actually used to raise a crop of corn, nor over 3 feet for a crop of wheat, but in places much water is run into low places and evaporated, and in the northern part of the Territory they frequently irrigate heavily in the fall so as to sprout the weed seeds and so kill them by frost, so it is likely that nearly or quite 4 acre-feet is diverted from a stream when the water is to be had, and not returned thereto, for each acre watered, even when planted in corn.

These tables show no columns of decrees, or the amount a ditch is legally entitled to take from a stream, as your letter of instructions directed me to show, because, as no adjudication of New Mexico ditches has been made, they have no legal title to any water.

XVII. DETAILED DESCRIPTION OF NEW MEXICO DITCHES OUTSIDE OF RIO GRANDE.

1. DISTRICT NO. 1, SAN ANTONIO.

Area, about 250 square miles.

Number of ditches listed, 11, on one sheet.

Aggregate capacity, 32 second-feet.

Acres watered, 1,270.

I have made district No. 1 to include those portions of the Pinos and San Antonio drainages which lie in New Mexico. This district all lies above 8,000 feet elevation, usually has a good water supply in spring from the heavy snows of the Conejos Range, and contributes water to district 22 of Colorado.

The settlement is old, all dating back to 1880. Until this year there

has never been a shortage of water in the district. So I have allowed the maximum of 4 feet per acre for all years except 1896. In the last-named year the two lower ditches on San Antonio Creek are charged with but 3 acre-feet per acre.

All totals from this, as well as all the New Mexico districts, are entered directly onto the summary for New Mexico, the total acreage for each year being obtained, unless otherwise stated, by deducting from the acreage shown on the detail sheets that portion of it charged to ditches built after the year in question.

2. DISTRICT NO. 2, CHAMA.

Area, about 3,300 square miles.

Number of ditches listed, 123, shown on three sheets.

Aggregate capacity, 1,016 second-feet.

Acres watered, 27,520.

The area I have assigned to district No. 2 comprises the whole Chama drainage except an area of some 4,500 acres, which is watered by ditches taken from the Chama but lies in the Espanola Valley, and is included in the Espanola sheet. This district lies between the Conejos Range, whose summit prolonged south into the Black Mesa bounds it on the east, and the Continental Divide, which forms its western limit. It reaches from the Colorado line (a small portion being, in fact, in that State) to the Jemez Mountains on the south.

Taken as a whole, this drainage is very broken, and in parts it is mountainous, the northern portion occupying the forks between the Continental Divide and the Conejos Range. It lies at an elevation above sea level of from 6,000 feet near the mouth of the Chama to over 10,000 feet on the Conejos Range. The heavy snow fall of that range furnishes the principal source of water supply, as the snow and rain-fall on the Continental Divide to the west is light in winter. Summer rains along it, however, frequently send large and sudden floods down the river, when it delivers the first silt-bearing waters which enter the Rio Grande.

The main Chama has but little valley land along it above Abiquiu, except a small area reaching from the town of Chama down the river to Puente Plaza, just below Parkview. The two largest cultivated areas in the district are the mesa lying around Parkview at the mouth of the Brazos or East Chama, as it is locally called, and El Rito Valley. The first usually has an abundant water supply from the Brazos, while the latter is always short of water.

Up the drainage of the Rio Caliente, which flows south close under the western toe of the Black Mesa and includes the Tucas or Petaca and Vallecito, there are numerous narrow valleys for which there is always an abundant water supply.

West of the Chama and north of the Gallinas drainage the country is broken and valueless for agriculture, although much valuable pine timber is found there, as well as on the head of the main drainage and down along the Conejos Range as far south as Mitritas Creek.

In the southwestern portion of the drainage on Rio Puerco and Rio Gallinas (this Rio Puerco being a branch of the Chama, and not the large torrential stream of that name, which lies farther south) there is a large area of fertile land, but a very scanty water supply. Out of probably 50,000 acres of good land on the Gallinas only 400 acres are cultivated, and even that small area is never fairly well supplied

with water. On the Puerco a larger proportionate area is irrigated, but the limit of water supply was reached many years ago.

From above Abiquiu, 25 miles above the mouth of the Chama, down to the Rio Grande, there are narrow bottoms of very fertile land, which have been cultivated for one hundred and fifty years or more. The water supply is usually ample, although it was a little short in 1896.

Along the Chama above Parkview there are some Americans who have settled there within the last fifteen years, but reference to the three sheets giving the list of ditches in this district will show you that nearly all the agriculture is old, dating back as far as 1730, at which date El Rito Plaza was founded.

I found it impossible to obtain any reliable information as to years (if any) after 1880, when the water supply was abnormally short in this district. I therefore, for the years prior to 1894, assumed the maximum use of 4 acre-feet per acre for all lands having a good water supply, 3 acre-feet per acre for that having a fair supply, including the Upper Nutrias, the Cebolla drainage from 1887 to 1890, the Canjilon prior to 1890, and El Rito prior to 1886; 2.5 acre-feet per acre for Canjilon in 1891 and 1892 and El Rito in 1887 to 1890, and 2 feet for those two sections until 1893 and for the Puerco and Gallinas country from 1880 on. This is based on a statement that the Cebolla and Canjilon water supply has been shrinking since 1887, and a known gradual decrease of water supply at El Rito.

The detail sheets show the amount charged to each ditch for the years 1894, 1895, and 1896.

3. DISTRICT NO. 3, CERRO MESA.

Area, about 710 square miles.

Number of ditches listed, 28, shown on one sheet.

Aggregate capacity, 194 second-feet.

Acres watered, 9,280.

The country assigned to district No. 3 reached from the Rio Grande Cañon on the west to the top of the Sangre de Cristo Range on the east, and from the Colorado line, on the north, southward as far as the Rio Hondo, including the irrigation in the valley of that stream, but excluding an area of 1,500 acres which is watered by a ditch from the Rio Hondo, but lies on the Taos Mesa and is included in district No. 4. It includes that portion of the drainage of Costilla Creek which lies in New Mexico, that of several small streams flowing into the Cerro Mesa, Red River, and Cabresto Creek, Lerma Cañon, San Cristobal and Lobo creeks, and Rio Hondo. The northern portion contains a large, smooth mesa, called Cerro Mesa, which reaches from the Colorado line to Red River, and forms a fine body of grain land, lying at an elevation of about 8,000 feet, or a little less, above sea level. From Red River to Rio Hondo the country is broken and contains but little arable land. In the Rio Hondo there are two good valleys.

The water supply in the Costilla, Cobresto, Red River, and Rio Hondo is good, coming as it does from the summit of the Sangre de Cristo, locally called the Costilla Mountains. The south end of the Cerro Mesa is watered from Cobresto Creek, and always has all the water needed. The central portion of the mesa is watered from four small creeks. The Mexican settlement of Cerro, started in 1852, has for many years used the entire flow of these creeks, and then had but a

scanty supply. In 1883 their crop was a failure from lack of water. In 1886 some Americans settled on the streams below the Cerro ditch and by some means obtained a court decision or a compromise with the Mexicans of Cerro Plaza, which awarded to them one-fourth of the water in the creeks. The result is that the supply of water, already scanty, is spread over a larger area than before, all are very short, and only partial crops are raised each year.

The town of Rio Colorado, located at the junction of Red River and Cobresto Creek, was founded in 1842, and irrigation soon spread over the south end of the Cerro Mesa, the Llano ditch from Cobresto Creek being built in 1851. The people are good farmers, who do not waste much water. For this reason I have allowed but 3 acre-feet per acre under the main ditch here and 3.5 acre-feet per acre under the next in size instead of 4 acre-feet.

On San Cristobal Creek the water supply is just about enough for the small amount of land under ditch. On the Lobo the supply is scanty and several men who have tried to farm there have abandoned the attempt.

The Rio Hondo supply is usually good.

I could locate no years of special drought in this district except 1883, and so have estimated a uniform use of water.

4. DISTRICT NO. 4, TAOS MESA.

Area, about 480 square miles.
Number of ditches listed, 61, shown on one sheet.
Capacity of ditches, 346 second-feet.
Acres watered, 18,050.

Stretching from the brink of the Rio Hondo Cañon southward to the foot of the Picuris Mountains—some 20 miles—is a level mesa which forms the most historic portion of New Mexico outside of the city of Santa Fe. It is called the Taos Valley, but is really a high mesa some 7,000 feet above sea level, and lying between the foot of the Sangre de Cristo Mountains (locally called Taos Mountains) and the Cañon of the Rio Grande. The area of arable land is fully 40,000 acres, but the water supply is only sufficient for about half this land, and it has been fully utilized for over forty years. This section I have made district No. 4, its boundaries being the Rio Grande Cañon on the west, the top of the range on the east, the south side of the Rio Hondo Cañon on the north and the top of the Picuris Mountains on the south. It is watered by Lucero, Pueblo, and Taos creeks, Rio Chiquito, and the Rio Grande del Ranchos de Taos. All these streams carry snow water from the high divide, run in canyons until the plain is reached, and then cross it in shallow channels. Up Taos Cañon are numerous small valleys, each occupied by a small ranch and ditch, but no valleys are found on the other streams.

The Mexican settlement of Fernandez de Taos was made about 1800, possibly prior to that time, and the settlers found the land along Lucero and Pueblo creeks already occupied by the Taos pueblo of Indians, who had lived there for an unknown length of time. Prior to 1830 the Arroyo Seco settlement was started on the north end of the mesa, water being first taken from Arroyo Seco and then by an extension to the ditch southward along the foothills from Lucero Creek. It was soon found that this source of water supply was uncertain, and in 1830 a ditch was taken out of the Rio Hondo and brought

out of the mesa west of the plaza. Some time prior to 1860 the waters of the Río Chiquito and Río Grande de Taos were taken out and as much of the mesa as possible put under ditch.

On Lucero and Pueblo creeks the water is all distributed by numerous small ditches whose positions are changing each year. It was difficult for me to form even an approximate estimate of the acreage in the limited time at my disposal as well as to get the exact number of ditches. I believe, however, that the aggregate given on the sheet is fairly accurate.

On this mesa the people have learned to be careful in the use of water, so that the average amount used, even in years of plenty, is about 2.5 acre-feet per acre. I think that 1894 and 1895 were average years, and so have assumed that the use of water shown on the sheet for those years is a good average for the use during the years prior thereto except 1889. For 1889 I deducted 15 per cent from the amount charged to the other years, thinking that the shortage of that year, due to small rainfall, would have been felt here to the above amount. The detailed estimate made under each ditch shows an average for 1896 of about 1.75 acre-feet per acre.

5. DISTRICT NO. 5, EMBUDO CREEK.

Area, about 430 square miles.

Number of ditches listed, 32, shown on one sheet.

Aggregate capacity, 236 second-feet.

Acres watered, 9,120.

South of the Picuris Mountains is the drainage of Embudo Creek, made up of the main stream, called Penasco on its upper portion, Picuris or Pueblo Creek, Las Trampas, and Ojo Zarco creeks.

The main stream joins the Río Grande a short distance above the railroad station of Embudo, near the north end of Espanola Valley. The surface of this district is broken, each stream flowing in a deep valley, which widens occasionally to a mile between the hills, but is generally narrow. The Picuris and Penasco head on the range, and carry a large and constant volume of water. Las Trampas carries a fair supply, but Ojo Zarco is a very small stream.

The valleys in this district were occupied by Mexicans at a remote date, probably about 1815, but the Picuris pueblo of Indians were already on Picuris Creek, and had been there for an unknown length of time. After the first settlement the valleys quickly filled up, and before 1880 even the little meadows up the Cañon of the Picuris were occupied. The water supply was ample for all. In 1880 the owners of the Mora grant, which lies east of the range, came onto the head of Picuris Creek and diverted some of its waters through a pass in the mountains onto their land. There was still water enough for all until 1890, when it is stated that these people built a second ditch and took away an additional amount of water as large as they had at first appropriated. Since then there has been a shortage each year on Picuris Creek, reaching its maximum this year. A fair crop was made, however, in 1896.

On Penasco and the main stream there is always an ample supply of water. The irrigated land lies close along the streams all through this district and has a gravelly subsoil, which quickly returns to the channel all water not evaporated or transpired by the growing crop. I have thought best, therefore, to estimate but 3 acre-feet per acre each

year. On Picuris Creek I made this allowance prior to 1889 and for that year, and afterwards I allowed 2.5 acre-feet per acre up to 1896. In the last-named year I estimated 2 acre-feet per acre.

6. DISTRICT NO. 6, SANTA CRUZ.

Area, about 480 square miles.
Number of ditches listed, 43, shown on one sheet.
Aggregate capacity, 156 second-feet.
Acres watered, 5,800.

Between the drainage of Embudo Creek and that of Santa Fe Creek is a rough and broken country, traversed by two main streams called the Santa Cruz River and Pojuaque or Nambe Creek. These head on the Sangre de Cristo Range (here called Santa Fe Mountains) and carry from it snow water to the Espanola Valley. This area I have called district No. 6, excluding therefrom all land watered from the Santa Cruz or Pojuaque but lying in the Espanola Valley. The irrigation is confined to the long, narrow valleys which border each stream. The date of settlement is uncertain, but remote, possibly as far back as the first or second decade of the eighteenth century, although the Nambe and Pojuaque Indians occupied their pueblos on the more southerly stream at a period much more remote than this date.

On Santa Cruz River the water supply is fair, but on the Nambe it is poor. There has been no known change in acreage since 1880. In 1889 I deducted 15 per cent from the estimated water used in 1894, making the estimate for all other years prior to 1894 the same as for that year. The estimates for 1894, 1895, and 1896 are shown in detail on the sheet.

7. DISTRICT NO. 7, SANTA FE CREEK.

Area, about 480 square miles.
Number of ditches listed, 44, shown on two sheets.
Aggregate capacity, 97 second-feet.
Acres watered, 5,920.

The drainage of Santa Fe Creek forms district No. 7 and extends from the top of the Sangre de Cristo (here called Taos Mountains) on the east to the Rio Grande on the west. After leaving the foothills some 4 miles east of Santa Fe, the creek of that name flows in a shallow channel through a level plain for some 15 miles. It then enters a cañon, which it follows to La Bajada, where it again enters an open country. The principal use of water is in the country around Santa Fe, which, lying at an elevation of about 7,000 feet above the sea and protected by hills on all sides except the west, produces cereals and apples to perfection. This valley is the most historic spot in New Mexico. Here was established the nucleus of the Spanish occupation in 1600; here were they defeated in 1680 and forced by the Pueblo Indians to abandon the country; and here they finally conquered the natives in 1692 and firmly established themselves in the possession of the land. Even prior to 1600 the Indians occupied the site of Santa Fe and farmed the surrounding land, although the later conquest forced them to abandon their pueblo.

For a great many years the full flow of Santa Fe Creek has been utilized for irrigation, and the scanty amount of water available has been husbanded with great care and made to serve as much land as possible. The water is alternated among the different ditches, and the

amount carried annually by each ditch on the main stream is said to be equal, in ordinary years, to the full capacity of the ditch flowing forty days. In 1896, and probably in 1889, the amount carried was probably some 20 per cent less than this. On this basis was the estimate for 1894, 1895, and 1896 made for the ditches shown on sheet No. 1.

The ditches listed on sheet No. 2 are all, except the last two, on side drainages fed by springs, and the use of water by them has been larger and more constant than on the main stream. La Bejada usually has plenty of water, as there are springs in the cañon above the head of the ditch, but no water flows into the Rio Grande except in time of flood. That small portion of the ordinary flow which escapes La Bejada ditch sinks away in the sandy channel of the river just below the plaza.

8. DISTRICT NO. 8, GALISTEO.

Area, about 1,400 square miles.

Number of ditches listed, 23, shown on one sheet.

Aggregate capacity, 60 second-feet.

Acres watered, 2,240.

The Sangre de Cristo Range ends abruptly southeast of Santa Fe, the country rapidly falling to the south into the wide, barren Galisteo plain. Galisteo Creek is the last stream carrying any snow water west into the Rio Grande, and its supply is small and precarious.

Between the Galisteo plain and the Rio Grande is a range of hills called the Sandia Mountains, which have a few little valleys with a small supply of spring water. All this section I have placed in district No. 8. It is a barren, desolate country. Irrigation is confined to the little valleys along Galisteo Creek and those mentioned in the Sandia Mountains. Around Galisteo plaza there is a large area of fertile land, but water for only a small percentage of it.

All of the settlements in District No. 8 are old, antedating 1880 by many years. To all years except 1889 and 1896 I have given the same use of water, amounting to nearly 2 acre-feet per acre, as shown on the sheet; but in the two years mentioned I have allowed but about 1.3 acre-feet per acre.

That portion of the Rio Grande drainage east of the river and south of the Sandia Mountains and Galisteo plain is devoid of living water all the way to El Paso. There is not, so far as my acquaintance extends, an acre of cultivated land in this whole area east of the river bottom. A portion of this area is included in districts 14 and 15. The rest is unattached.

9. DISTRICT NO. 9, JEMEZ.

Area, about 900 square miles.

Number of ditches listed, 27, shown on one sheet.

Aggregate capacity, 131 second-feet.

Acres watered, 5,790.

South of the Chama and west of the White Rock Cañon of the Rio Grande there lies a group of high and rugged mountains called the Jemez Mountains. Their highest peaks reach an altitude of over 11,000 feet, while the average height is over 9,000 feet above sea level. They present precipitous battlements to the north, west, and east, but their summits form the rim of a huge basin which slopes inward and to the south. The Jemez River gathers the drainage of this basin through several branches. High up near the summits are large, open parks, where, as well as on the peaks, the snowfall is generally heavy.

Deep cañons lead from these parks to the lower country, where are long and narrow, but very fertile, valleys. Below these valleys the river runs through a barren, sandy country to its junction with the Rio Grande. Much of its water sinks away in the sands or spreads out and is evaporated under the hot sun, so that but little water enters the main river from it except during the spring floods.

Before the advent of the Spaniard, some hundred years or more ago, three tribes of Indians occupied their pueblos on this river. They were named the Jemez, Zia, and Santa Ana, the Jemez being highest up the river. The Spaniards on entering the country occupied a vacant body of land lying above the Jemez Pueblo and another lying below it, but above the Zia and Santa Ana pueblos, and appropriated the water which had been formerly used by the two last-named pueblos. The Santa Anas were first to suffer, and they were finally forced to take up and cultivate land on the Rio Grande, some 10 miles away. Such is the tenacity, however, with which these Indians cling to their ancient pueblos that, although this change was made nearly or quite a hundred years ago, the Santa Anas still pack the season's crop each fall over a horrible trail 10 miles up from the Rio Grande to their ancient home, steadfastly refusing to abandon it and build anew near their tillable land.

The Zia Indians still eke out a precarious existence from the use of what little water passes the Jemez Indians and the Mexicans of San Ysidro. Above them, however, there has never been known to be an injurious shortage of water until 1896, although there was a sensible diminution of the usual water supply in 1894 and 1895. I could not learn that the shortage of 1889 affected this drainage, and so have made no reduction in the estimate for that year.

There are some grass lands watered from the higher ditches, while lower down the climate is warm, evaporation great, and the soil such as will not readily return to the river surplus water. I have therefore allowed, prior to 1894, 1895, and 1896 (the allowances for which years are shown on the detail sheet), 4 acre-feet per acre for lands above San Ysidro, 3 acre-feet per acre for its lands, and 1.5 acre-feet per acre for the Zia lands.

10. DISTRICT NO. 10. PUERCO.

Area, about 6,400 square miles.

Number of ditches listed, 62, as shown on two sheets.

Aggregate capacity, 580 second-feet.

Acres watered, 18,380.

West and southwest of the Jemez Mountains the character of the country changes. Still broken and hilly, its altitude is 2,000 feet or more lower than that of the Jemez, and, as there is but very little snowfall, there are few perennial streams. It is subject, however, to heavy rains, the annual precipitation sometimes coming in a few hours, and the resulting torrents have washed down from the hills and mesas large quantities of earth, which have formed extensive alluvial valleys. While the country slopes from the Continental Divide toward the Rio Grande, a large percentage of it never furnishes water to the river, as the broken surface of the arid land absorbs the whole precipitation.

In district No. 10 I have included the whole area tributary to the Rio Puerco, although but a small per cent of the total area is arable land, and but a small fraction of the latter has a water supply. This

district extends to the Continental Divide on the west and to the summit of the watershed between the Puerco and Salado on the south. Northward it extends up past the Jemez Mountains to the Rio Chama drainage. The northwestern half consists of the barren Chama Mesa, which ends in Mount Taylor on the south and breaks over into the Chama drainage on the northeast.

The Puerco River runs from north to south through the eastern portion of district No. 10. Aside from storm waters its whole supply is derived from the western slope of the Jemez Mountains. Several little streams run down from this slope; each has a little valley on it and each valley is tilled. A small amount of water reaches the main Puerco, but is there used on the fertile alluvial soil of the river valley. At Cuba the channel of the stream is cut down some 40 feet into the ground, but has not yet reached the bottom of the soil. On the upper half of the immediate valley of the Puerco the rainfall is greater than farther south, and this, together with the great capacity of the soil for retaining moisture, enables the farmers to raise good crops of corn, even when they have water for irrigation but a month or six weeks in the spring. These summer rains come suddenly and heavily, and the Puerco sometimes changes, in two or three hours, from a dry, sandy bed to a torrent of 15,000 or 20,000 second-feet. These floods carry as high as 15 per cent of silt.

The head waters of the Puerco originally formed part of the Apache Indian country, and settlements were not made by the Mexicans until 1872; but then a large body of them moved in at once and all of the available water was quickly appropriated.

The only tributary of importance to the Puerco is the San Jose or Blue Water, which has its source in the Zuni forest, on the continental divide. It generally receives from this forest considerable water in the spring. After leaving the mountains its valley is much like that of the Puerco, a deep, rich alluvial soil. The Laguna and Acoma Pueblo Indians are the original settlers, the former having two outlying communities, Ensenada and Pajuate.

A few farms were taken up in 1880 on the Zuni plateau, while the springs around the base of Mount Taylor north of the San Jose were appropriated at a much earlier date.

I could not learn of but one year's unusual shortage of water on the Puerco prior to 1896, viz, 1889. The people there live in a chronic state of short water supply. On the San Jose, however, it seemed to be the impression that there was not so much water available since 1889 as prior to that year. I therefore assumed that the amount of water returned on the main Puerco for 1894 represented the use back to 1880, except for 1889, when a proper reduction was made all over the district; but prior to 1889 I added 20 per cent to the San Jose use of water for 1894.

You will notice that ditches Nos. 5 and 6 on the Blue Water are large and recently constructed. In 1894 a company built a dam and reservoir on the Zuni plateau, the site being a very fine one, and dug these two ditches, which are said to cover some 5,000 acres of fertile land. The reservoir was filled with water in the winter and spring of 1894-95, settlers placed on the land, and some 1,600 acres cultivated in 1895.

But the winter of 1895 failed to bring the usual snowfall on the plateau, their reservoir was not filled, and the season of 1896 saw but some 600 acres cultivated, with a small supply for even that. It was the intention of the owners to raise the dam this year so as to impound more water, but this failure has discouraged them and the future of

the enterprise is uncertain. The reservoir will be described further along in this report.

II. DISTRICT NO. 11. SALADO TO BERENDA.

Area, about 5,500 square miles.
Number of ditches listed, 26, shown on one sheet.
Aggregate capacity, 85 second-feet.
Acres watered, 2,550.

All of its drainage area west of the Rio Grande and between the Puerco drainage and the Mexican line is a rough and broken country, with a scanty water supply. There are a few small streams, however, and the area including them I have placed in district No. 11.

The first stream met going south is the Salado, which empties into the Rio Grande a short distance below the mouth of the Puerco. While this stream is a torrent after heavy rains, it is practically dry nine-tenths of the year. In valleys among its hills there are two small settlements whose inhabitants eke out a scanty livelihood.

The country for 60 miles to the south of the Salado is without water for irrigation. Then cutting deeply through the Cuchilla Mesa are met several lines of drainage leading from the Black Range to the Rio Grande. Only in seasons of excessive snowfall or after heavy rain does the water flow from the hills to the river. But about midway between the two springs are found in the dry channels and the water from these is led into the long, narrow valleys below. While the water supply is scanty, it is constant, and the users have learned to utilize it fully, and they raise good crops with an amount of water so small that it would mean failure anywhere else in the Territory. The settlements all antedate 1880.

The water supply is regular, and the amount estimated for 1894 and 1895 is assumed to be the amount used back to 1880, except in 1889, when a slight reduction is made.

XVIII. RIO GRANDE VALLEYS.

For the purpose of studying the use of water along the main river, I have so divided the valley as to place in the same district those portions of it where the conditions as to water supply are somewhat similar.

There are six of these districts, numbered and briefly described as follows:

District No. 12. Espanola Valley; water supply good; cultivation continuous.

District No. 13. From White Rock Canyon to Albuquerque; water supply good at upper end, but sometimes fails at lower end; cultivation nearly continuous.

District No. 14. From Albuquerque to the mouth of the Puerco; water supply precarious; cultivation nearly continuous.

District No. 15. From mouth of the Puerco to San Marcial; water supply precarious, but helped by summer floods from the Puerco and Salado; cultivation in patches.

District No. 16. From San Marcial to old Fort Seldon; water supply scanty, but better than above on account of local drainage; cultivation in patches.

District No. 17. Mesilla Valley; water supply scanty, but usually sufficient to mature crops; cultivation continuous.

I will first describe these districts in detail, and then discuss the water supply as a whole.

1. DISTRICT NO. 12, ESPANOLA VALLEY.

Area, about 1,050 square miles, including 50 square miles of valley proper.
Number of ditches listed, 32, shown on two sheets.
Aggregate capacity, 400 second-feet.
Acres watered, 14,060.

On leaving the lower end of the long cañon which begins near the Colorado line the Rio Grande enters the Espanola or Chamita Valley. This valley is some 20 miles long and as much as 4 miles wide, having an area of about 50 square miles of arable land. About one-half of this area is now cultivated. This valley, including some small irrigated areas in the lower end of the cañon above Embudo station, I have called district No. 12.

The altitude of the Espanola Valley is about 5,500 feet above sea level, and the climate is such that peaches, apples, and grapes are raised. It is surrounded by hills. At its lower end the river enters White Rock Cañon. The upper end is watered by ditches taken from the main river, but the central and lower portion obtains its supply from streams entering the valley from its sides. These are the Chama and Santa Clara on the west and the Santa Cruz and Pojuaque on the east. The Chama furnishes water sufficient for some 4,500 acres, while the other streams, all of which are small, scantily serve about 3,500 acres.

In 1598 Chamita was founded by the Spaniards on the delta at the mouth of the Chama. They found three Indian pueblos in the valley, which they named the San Juan, Santa Clara, and San Ydelfonso. The date of their construction is unknown.

The settlement of Chamita was soon abandoned, but Santa Cruz Plaza was founded in 1609, and it is believed that it has been inhabited continuously by Spaniards and Mexicans ever since, except during the interval between 1680 and 1692.

The water supply of those ditches heading in the Rio Grande is ample, their aggregate capacity being only some 150 second-feet, while the minimum flow recorded during the irrigation season at the Embudo gauging station, situated at the upper end of the valley, is about 200 second-feet, although the record for September, 1889 and 1890, is a little smaller than this amount.

The Chama also furnishes a fair supply of water, although there was a shortage in 1896. This was not of sufficient extent, however, to injure crops.

The land depending upon the other streams for water receives a very scanty supply. The San Ydelfonso Indians get so little water from Pojuaque Creek that they have extended the Hobart ditch taken from the Rio Grande down to their land, and will use water from it in 1897. There is a large canal projected to leave the river on the east side about Embudo and cover all of the land of the valley east of the river. Owing to the many diverse interests involved, the ignorance and apathy of the native population, and the jealousy existing between them and the Indians, it is doubtful if any agreement can ever be reached and the canal constructed.

All of the ditches in the Espanola Valley long antedate 1880, except the Hobart ditch. This was built in 1893, but waters land formerly covered by Santa Cruz ditch No. 5, but cut off from it in 1884 or 1885 by a caving bank breaking the ditch. This land laid idle from 1885 to 1893.

I have made a small reduction from the average use of water to obtain the probable amount used in 1889. Aside from that and from the amount used in 1896, the use is about constant. For all the land watered from the Rio Grande, 4 acre-feet per acre is assumed. For those from the side streams, varying amounts are assumed, fully shown on the detail sheets. The water supply of this district need not be further considered.

2. DISTRICT NO. 13, UPPER ALBUQUERQUE.

Area, about 830 square miles.

Number of ditches listed, 22; shown on one sheet.

Aggregate capacity, 311 second-feet.

Acres watered, 8,070.

On leaving White Rock Cañon about due west of Santa Fe the river enters a long valley of varying width, bounded by the low hills which form the edge of the mesa on either side. That portion of this valley which lies between the mouth of the cañon and Albuquerque I have included in district No. 13, naming it Upper Albuquerque district.

The soil is very fertile, but the land lies low and nearly level and has very poor drainage.

In district No. 13 are four Indian pueblos, viz, Cochiti, Santo Domingo, San Felipe, and Sandia, which all have ancient ditches. The Santa Anas also have two ditches in this district, as mentioned in the description of the Jemez drainage.

The Mexicans, or Spaniards, settled on the vacant land in this district from one hundred to three hundred years ago. While the arable land probably amounts to over 40,000 acres, only about 8,000 is under cultivation. Much of the balance has been tilled at some time in the past; but as the land lies nearly level, and so has little natural drainage, as mentioned above, the lavish use of water has filled it with alkali and much of it has been abandoned, the owners simply moving back onto a little higher ground. I could see nothing, however, to lead me to the belief that the total acreage had raised materially in the past fifteen years.

Before considering the use of water from the main river below White Rock Cañon I will describe the remaining districts and then collate and arrange chronologically all the more important information which I collected concerning the water supply and deduce therefrom a general scheme for estimating the amount of water used since 1880.

3. DISTRICT NO. 14, LOWER ALBUQUERQUE.

Area, about 940 square miles.

Number of ditches listed, 33; shown on two sheets.

Aggregate capacity, 1,168 second-feet.

Acres watered, 17,840.

District No. 14 I have made to cover the valley of the Rio Grande from Albuquerque to the mouth of the Puerco, and have named it the Lower Albuquerque district. The general conditions are about the same as above Albuquerque, although the valley is a little wider here than there. The Isleta Indians are the oldest inhabitants. The Mexicans came in from one hundred to three hundred years ago, and all the settlements long antedate 1880. San Jose ditch No. 2 was built in 1888, but it was the result of a neighborhood quarrel, and covers land previously watered by San Jose No. 1.

While there is fully 75,000 acres of arable land in the district, less than one-fourth of this amount is cultivated. Much formerly watered has been abandoned and is now marsh land, white with alkali.

In this district and in district No. 15 evidence exists of there having been more land under cultivation at one time than is now tilled. I am satisfied that the shrinkage in these two districts is fully 10 per cent, the larger proportion of it being in district No. 15. I was told that this contraction of area occurred about 1880, being caused by the Mexicans leaving their land to work on the construction of the Atchison, Topeka and Santa Fe Railroad. I have therefore added to district 14 about 1,500 acres prior to 1880 and about 500 acres for 1880.

The lower end of this district suffers worse from a scanty water supply than does any other portion of the river valley. In the past ten years there has frequently been a shortage as far north as Albuquerque.

4. DISTRICT NO. 15, SOCORRO.

Area, about 800 square miles.

Number of ditches listed, 16, shown on one sheet.

Aggregate capacity, 300 second-feet.

Acres watered, 5,790.

After passing the mouth of the Puerco, the valley of the Rio Grande becomes narrower and the mesa bluffs higher and more rugged. District No. 15 I have made to include what valley land there is between the mouth of the Puerco and San Marcial, and have named it the Socorro district. The occupation of the district as far south as Socorro is quite old, this place having been, I am told, settled about the same time as Albuquerque. Below Socorro, however, the settlement is more recent, one small ditch having been built as late as 1881.

There is probably not more than 20,000 acres of arable land in the whole distance of 50 miles from the mouth of the Puerco to San Marcial, and of this less than 6,000 acres is tilled. The evidence of a shrinkage in the area cultivated was here plain, and I therefore added to the 1894 acreage 1,200 acres prior to 1880, and enough to make a total of 6,000 acres in 1880.

The water supply is precarious, but better than in district No. 14, on account of storm waters entering this district from the Puerco and Salado. These streams are moderately certain to bring in a large quantity of mud and water at some season of the year. The labor of keeping ditches clean is here excessive, and each land owner is assessed a day's labor per week for each 5 or 6 acres watered.

5. DISTRICT NO. 16, RINCON.

Area, about 600 square miles.

Number of ditches listed, 17. (Two of these are abandoned.)

Aggregate capacity, 295 second-feet.

Acres watered, 9,850.

District No. 16 extends from San Marcial to old Fort Seldon, at the upper end of the Mesilla Valley, and I have named it the Rincon district. Just below San Marcial the river swings to the westward, running around Fra Cristobal and Caballo mountains, which form the western battlements of the Jornada del Muerto. The bluffs are near together and leave between them only small valleys until the river turns eastward again around the Caballos, toward Rincon. There the

valley widens and four-fifths of the tillage in the district is found in an almost solid body, which is watered by two large ditches, the Colorado and Loma Padre.

This country was overrun by the Apaches until about 1860, and no settlements were made until 1862 or 1863. Then part of the small upper valleys were occupied, and a few years later the lower and larger valley was settled and the Colorado ditch built. About 1884 some people took up the remaining small valleys. In 1892 a large number of families who had become disheartened by the continued failures of crops in the El Paso and the lower end of the Mesilla valleys left that country and, moving into the bosque above Rincon, took out the Loma Padre ditch, irrigating their first crop in 1893. The colony is now flourishing, having raised a good crop in 1896 from an area of about 3,600 acres, all of which has been reclaimed from the bosque in the last four years.

The water supply of district No. 16 is rather precarious, but the irrigators are skillful and crops are raised with a small amount of water.

6. DISTRICT NO. 17. MESILLA VALLEY.

Area, about 150 square miles.

Number of ditches listed, 12 (one of these is abandoned).

Aggregate capacity, 679 second-feet.

Acres watered (1896), 27,100.

The Mesilla Valley extends from Old Fort Seldon to the pass, some 5 miles above El Paso. Together with the El Paso Valley below the pass, it forms the most fertile area along the whole river. The altitude of the Mesilla Valley is a little under 4,000 feet. The climate is warm, and fruit of remarkably fine flavor is raised in abundance.

I could not learn, however, that the valley was settled at an early day. Dona Ana was in existence in 1846, but was then new. It is probable that the Apaches prevented earlier Spanish or Mexican occupation.

The valley filled up rapidly after 1846. In 1865 some 35,000 acres were in cultivation. In that year the river made a change of channel, breaking up the ditches, and the acreage decreased somewhat. The year of 1879 was one of poor water supply. As a result of this, the Picacho ditch, watering some 2,500 acres west of the river, about opposite to Las Cruces, was abandoned. A considerable area under the Dona Ana ditch was also soon after abandoned, the land watered by it decreasing from 7,000 acres in 1882 to 4,600 acres in 1888. All of this 2,400 acres still remains idle except some 800 acres, which a man named Schiller has colonized and is irrigating with water pumped from wells. This area is not included in my estimate of acreage.

In 1884 a severe flood started another change of channel near the lower end of the valley, and the high waters of 1885 and 1886 completed the work. This change of channel cut into several pieces La Union ditch, previously watering some 4,000 acres, and caused the temporary abandonment of nearly all of the land. In 1892 the people took out a new ditch on the east side of the river, the old one having been on the west side, and are now reclaiming and cultivating their old land.

The changes of acreage since 1880 have been so many in the Mesilla Valley that I append to the list of ditches for the district a table showing the probable acreage watered each year since 1880 by the individual ditches.

XIX. USE OF WATER IN THE RIO GRANDE VALLEYS.

The following is a compilation of the specific information I have at hand concerning the flow of the Rio Grande, with especial reference to summer seasons of abnormally low water:

1851. River dry at Las Cruces for one month.
 1861. River dry from Socorro down to and below El Paso.
 There was another year between 1861 and 1879 when the river was dry, but I am not able to locate it.
 1879. At Del Norte. High water in main river.
 At Los Lunas. River dry two weeks.
 At Picacho. River dry; no crop raised.
 At Socorro. River dry six weeks.
 At San Marcial. River dry six weeks.
 At Palomas. River dry six weeks.
 At Las Cruces. River dry from the end of July to the end of October.
 At La Union. River dry.
 At El Paso. River dry.
 1880. At Del Norte. Surplus; more than needed for irrigation.
 1881. At Del Norte. Surplus; more than needed for irrigation.
 1882. At Del Norte. Surplus; more than needed for irrigation.
 1883. At Del Norte. Surplus; more than needed for irrigation.
 At Palomas. Surplus.
 1884. At Del Norte. Largest flood known to residents of the valley.
 At Albuquerque. Flood.
 At Socorro. Big flood in May.
 At Palomas. Big flood in May.
 At Las Cruces. Big flood in May.
 1885. At Del Norte. More water than needed for irrigation.
 At San Marcial. Flood.
 At Palomas. Flood.
 At Las Cruces. Small flood.
 1886. At Del Norte. Heavy snows in valley in 1885-86; surplus.
 At San Marcial. Flood.
 1887. At Del Norte. Good average flow.
 1888. At Del Norte. Good average flow.
 At Socorro. Thought to have been dry (?).
 1889. At Del Norte. Gauge showed mean flow.
 At Embudo. Summer flow about mean flow.
 At Las Cruces. River went dry.
 At Picacho. River went dry.
 At Socorro. River went dry.
 At Palomas. River went dry.
 At Mesilla. Very dry until late fall.
 At El Paso. River was dry from August 5 to the latter part of December; longest time recorded.
 1890. At Del Norte. Gauge showed mean flow.
 At Embudo. Gauge showed large flow.
 At Las Lunas. Had water all summer.
 At Socorro. Thought to have been dry (?).
 At Palomas. A good amount of water.
 At Mesilla. All the water needed.
 At El Paso. Summer flow large, shown by gaugings.
 1891. At Del Norte. Gauge showed mean flow.
 At Embudo. Gauge showed largest summer flow recorded.
 At Las Lunas. Had water all summer.
 At Socorro. Thought to have been dry (?).
 At San Marcial. Water all summer.
 At Palomas. Dry a short time (?).
 At Mesilla. Had all the water needed.
 At El Paso. Summer flow very large.
 1892. At Del Norte. Summer flow small.
 At Embudo. Gauge showed summer flow to be above mean.
 At Las Lunas. River was dry July 1 to September 20. No flood in the spring.
 At Socorro. Thought to have been dry.
 At Sorocco. Dry six weeks (?). High water in spring (?).

DISTRIBUTION OF WATERS OF THE RIO GRANDE.

91

- At San Marcial. River was dry.
- At Palomas. River was dry a long time.
- At Mesilla. Had all the water needed (?).
- At El Paso. Gauge showed dry from early in August until fall.
- 1893. At Del Norte. Gauge showed summer flow small.
- At Embudo. Gauge showed summer flow a little below mean.
- At Las Lunas. Had waterable summer, but there was no spring flood.
- At Socorro. Had waterable summer.
- At Socorro. Dry six weeks (?).
- At San Marcial. River dry until September or October (?).
- At Palomas. A good deal of storm water, but normal flow small.
- At Colorado (above Rincon). Somewhat short of water.
- At Mesilla. Said to have been the poorest water supply for six years.
- At El Paso. River was probably dry in June, then a flood, and no record beyond that time.
- 1894. At Del Norte. Gauge showed smallest summer flow recorded (smaller than 1896).
- At Albuquerque. River was dry during July.
- At Las Lunas. River was dry June 24 to August 10.
- At Sabinal. River was dry June 22 to July 22.
- At Picacho. River was dry one month.
- At Socorro. River was dry.
- At San Marcial. River was dry June to November. (?)
- At Palomas. River was dry a long time.
- At Colorado. Short of water.
- At Las Cruces. Waterable the season. (?)
- At Mesilla. River did not go quite dry.
- At Chamberino. Short of water, but fair crop.
- At El Paso. No gauge record; river was dry in July.
- 1895. At Del Norte. Gauge showed summer flow a little above the mean.
- At Del Norte. Gauge showed summer flow about mean.
- At Albuquerque. river was dry through July. (?)
- At Las Lunas. had water all summer, but no flood in spring.
- At Sabinal. River was not dry.
- At Picacho. River was not dry.
- At Socorro. River was nearly dry.
- At Socorro. River was dry two weeks in June.
- At San Marcial. River was dry a few days.
- At Palomas. River was not dry.
- At Colorado. Good supply of water.
- At Las Cruces. River went dry last of June and then the supply was precarious.
- At Mesilla. River was dry six weeks.
- At Chamberino. Water enough to make a good crop.
- At El Paso. No gauge record that can be used.
- 1896. At Del Norte. Gauge showed summer flow small; said by old residents to be the driest year ever known.
- At Embudo. Gauge showed very small flow.
- At Pena Blanca. River lowest ever known.
- At Albuquerque. River was dry June 20 to September 19.
- At Las Lunas. River was dry June 18 to July 20; a small flow July 20 to August 5. Dry August 5 to September 20.
- At Sabinal. River went dry June 15, and was still dry October 3; weeds growing clear across the channel.
- At Picacho. River went dry June 10, and was still dry October 3.
- At San Marcial. River was dry from early June to latter part of August; then there was a little water.
- At Mitchell's Ranch. River was dry June 14 to July 6; then very small flow.
- At Palomas. River was nearly dry June 1; entirely dry June 15 to September, then up and down. (There is a rock reef across the river near here which forces to the surface the seep water moving in the sands of the river, the minimum flow here is 6 second-feet.)
- At Loma Padre. River was dry two weeks in July, but then there was water from rains.
- At Colorado. Short of water.
- At Las Cruces. River was dry June 10 to July 1, then water in spurts.
- At Mesilla. River was dry June 4 to July 21, then precarious.
- At San Miguel. River was dry June 1 to July 25; water July 27 to August 4.

- At San Miguel. River was dry August 4 to September 1, then water. (The San Miguel notes are accurate, being taken from a record.)
1896. At Chamberino. River was dry May 27 to August 1; there was water one-third of August.
- At Chamberino. River was dry September 1 to September 20, then water; short crop.
- At El Paso. Gauge record shows very low water after May 1, and dry as follows: May 26 to July 2, July 7 to July 17, August 23 to September 2, and September 7 to September 22. The flow between these dates was small.
- General. Believed in the San Luis Valley that omitting 1896, the dry year, and 1884, the flood year, the other years average up, and as much water now comes from the mountains as ever. But owing to the destruction of timber both by fire and sawmill men, the snows melt earlier in the spring and run off more quickly, and so the flood comes sooner and does not last as long as formerly.
- At Embudo: The summer flow since 1889 or 1890 is estimated to be about one-half that of former years.
- At San Felipe, above Albuquerque. There is always plenty of water to here, but it begins to fail below.
- At Albuquerque. Said to have always been a "big river" all summer prior to 1884. (?)
- At Pena Blanca. Believed to be only one-third as much water now as formerly.
- At Picacho. There was a dry year between 1879 and 1889.
- At Palomas. There was a dry year between 1879 and 1889.
- At Dona and Las Cruces. The water began to fail in 1884 or 1885. (This was the summer flow, not spring.)

You will notice many conflicts in this testimony. I have marked the more uncertain with a question point. But I thought it best to give you all the evidence I have, so you may be able to weigh it yourself. Of course, the personality of the informants enters largely into a consideration of the testimony. I have borne this in mind in my study of it.

From this data, supplemented by a personal knowledge of the country covering the last seven years, and by a study of the meager rainfall records available, I have made up the following allowances of water per acre for the different years on irrigated land along the river between White Rock Cañon and El Paso:

- Prior to 1880. Allow 4 acre-feet per acre. This is to represent an average use for ordinary years. In 1879 less than this was used.
1880. Allow 4 acre-feet per acre.
1881. Allow 4 acre-feet per acre.
1882. Allow 4 acre-feet per acre to Albuquerque.
Allow 3 acre-feet per acre to San Marcial.
Allow 2.5 acre-feet per acre to La Union.
- 1883-1886. Allow 4 acre-feet per acre.
1887. Allow 4 acre-feet per acre to Hunnings Ditch at Las Lunas.
Allow 3 acre-feet per acre to La Union.
1888. Allow 4 acre-feet per acre to Albuquerque.
Allow 3 acre-feet per acre to San Marcial.
Allow 2.5 acre-feet per acre to La Union.
1889. Allow 4 acre-feet per acre to Bernalillo.
Allow 3 acre-feet per acre to Albuquerque.
Allow 2.5 acre-feet per acre to Hunnings Ditch (No. 55).
Allow 2 acre-feet per acre to Jarales Ditch (No. 65).
Allow 1.5 acre-feet per acre to mouth of Puerco.
Allow 2 acre-feet per acre to La Union.
1890. Allow 4 acre-feet per acre to San Marcial.
Allow 3 acre-feet per acre to La Union.
1891. Allow 4 acre-feet per acre to San Marcial.
Allow 3 acre-feet per acre to La Union.
1892. Allow 4 acre-feet per acre to Bernalillo.
Allow 3 acre-feet per acre to Hunning's ditch (No. 55).
Allow 2.5 acre-feet per acre to mouth of Puerco.

- Allow 3 acre-feet per acre to Socorro.
 Allow 2.5 acre-feet per acre to La Union.
1893. Allow 4 acre-feet per acre to Lemita ditch (No. 77).
 Allow 3 acre-feet per acre to San Marcial.
 Allow 2.5 acre-feet per acre to Loma Padre ditch (No. 103).
 Allow 2 acre-feet per acre to La Union.
1894. Allow 4 acre-feet per acre to Bernalillo.
 Allow 3 acre-feet per acre to Hunning's ditch (No. 55).
 Allow 2.5 acre-feet per acre to mouth of Puerco.
 Allow 3 acre-feet per acre to Socorro.
 Allow 2.5 acre-feet per acre to La Union.
1895. Allow 4 acre-feet per acre to Hunning's ditch (No. 55).
 Allow 3 acre-feet per acre to Colorado ditch (No. 104).
 Allow 2.5 acre-feet per acre to La Union.
1896. Allow 4 acre-feet per acre to Santo Domingo lower (No. 24).
 Allow 3 acre-feet per acre to Bernalillo.
 Allow 2.5 acre-feet per acre to Albuquerque.
 Allow 2 acre-feet per acre to Hunning's ditch (No. 55).
 Allow 1.5 acre-feet per acre to Jarales ditch (No. 65).
 Allow 1 acre-foot per acre to mouth of Puerco.
 Allow 2.5 acre-feet per acre to Lemitar (No. 77).
 Allow 2 acre-feet per acre to Loma Padre (No. 103).
 Allow 1.5 acre-feet per acre to lower end district 16 (No. 106).
 Allow 2.5 acre-feet per acre for Dona Ana, Las Cruces, and Mesilla.
 Allow 2 acre-feet per acre to La Mesa ditch (No. 114).
 Allow 1.5 acre-feet per acre to La Union.

In all cases the ditch named is given the amount mentioned as used above it.

You will notice that the evidence concerning flow indicates a dry year between 1879 and 1889. As the rainfall for 1882 was light, I have assumed it to be the year of shortage. It was either 1881 or 1882, and I am inclined to think it was the latter.

From these estimates the detail sheets for districts 12 to 17, inclusive, are filled in for 1894, 1895, and 1896 and the summary for New Mexico for the previous years.

I wish here to call your attention again to the fact that the amount of water I have estimated as used each year is not supposed to be all actually applied to the beneficial irrigation of a growing crop, but it is intended to show the approximate amount diverted by the ditches and lost to the drainage, being either dissipated by evaporation or by transpiration through the growing crops, or held in the soil but not quickly returned to the drainage.

You will notice that the capacity of many of the ditches listed is sufficient to carry many times the amount of water charged to them. For instance, Rio Grande ditch No. 53, named Los Lentos, has a capacity of 40 second-feet or 80 acre-feet per day, while the maximum charged against it is 2,400 acre-feet, or but thirty days' run of its full capacity. In a year of plenty this ditch may carry water for over two hundred days, but a large part of its flow will tail directly into the river or into a lower ditch and eventually into the river. Another large part runs across the surface of the ground and so goes back, while only a small portion of the water taken from the river is actually put to a beneficial use.

As before stated, I recognized this condition early in the investigation and so resorted to collecting statistics as to acreage watered, studying at the same time the methods of irrigation employed, with a view of determining a maximum amount of water that it was likely was used per acre. The result of my study is the assumption of 4 acre-feet per acre.

XX. EL PASO VALLEY.

On passing El Paso, the Rio Grande, which here forms the boundary between the United States and Mexico, enters El Paso or Ysleta Valley. This valley is some 50 miles or more long, and varies in width from 4 to 5 miles. The Emory and Salazar boundary survey map gives this valley an area, by scale, of about 220 square miles. Of this area, probably two-thirds is arable land, the rest being river channels, either abandoned or in use, swamps, or sand hills. This makes the estimated acreage of arable land in the El Paso Valley about 95,000 acres.

This valley was occupied by the Spaniards over three hundred years ago. In 1600 Paso del Norte (now called Juarez) was an important town, and records are in existence over two hundred and eighty years old which refer to the Acequia Madre of Paso del Norte as being then in use.

Owing to the limited time at our disposal, and also to the fact that the use of water which had supposedly injured this valley was all, of course, above it, we did not extend our detailed examination below El Paso. From all I could learn, however, from old inhabitants, I should judge that in former years some 40,000 acres of land were tilled in this valley, more than half of which was on the Mexican side of the river. This was watered by numerous ditches believed to have had an aggregate capacity of some 500 second-feet. This valley has long been noted for the fine quality of its fruit. The mission grape here grows to perfection, while fine peaches are also raised.

At the present time there are five or six ditches on the Mexican side, with an aggregate capacity of 200 second-feet or more. On the United States side there are a larger number of ditches, but all except the El Paso Canal are of small capacity. The El Paso Canal was built in 1888, with a claimed capacity of 400 second-feet. In its present condition its carrying capacity is not likely to exceed 150 second-feet. I am unable to give you an estimate as to the acreage now cultivated in this valley, but can safely say that it is considerably less than the amount formerly tilled—at least so far as the upper end of the valley is concerned. The water supply has become precarious and many farms have been abandoned, while crops have been light on those still cultivated.

It is in the El Paso Valley that damage to the residents of Mexico is claimed from the diversion of the waters of the Rio Grande in the United States. While, for reasons which I will state farther on in this report, I believe that this claim is well founded, I can not give you even an approximate estimate of the amount of damage done, nor do I consider it to be within the scope of this paper to take up the subject. I will say, however, that the citizens of the United States here have suffered to the same extent as their Mexican neighbors and that the loss to both has been much greater than it has been to the inhabitants farther up the river—for all have suffered as far north as Albuquerque—because as the flow of water decreased a greater and greater portion of what remained has been diverted above El Paso.

XXI. GAUGINGS AND FLOW OF THE RIO GRANDE.

In the winter of 1888-89 the United States Geological Survey organized a hydrographic branch and started work on the Rio Grande.

Stations were established in 1889 at Del Norte, Colo., Embudo,

N. Mex., and El Paso, Tex., and a record of the height of water in the river at each place has been kept for a portion of the time since, while attempts have been made to obtain records at other points on the main river, but so far without any trustworthy results.

On four sheets of the tables (see table of contents for the numbers thereof) I have arranged the records of these three stations and also that of another station established in 1895 at the upper end of White Rock Cañon and named Rio Grande. It is an important station, although the record is now too short to be of much value.

In tabulating these records I have divided them into two portions, which I have called, respectively, summer and winter flow, the first covering April to September and the second October to March. While the irrigation season in the San Luis begins after the middle of April and ends early in September, and while lower down the river it begins much earlier and ends later, I thought that the above division would fit all the conditions fairly well, and it would be safe to assume that the summer flow was all available for irrigation except in time of flood, when much must necessarily run to waste, but that the winter flow was all, or nearly all, unavailable and unused for irrigation.

In order that the record of a gauging station may be of value, the cross section of the station should be moderately permanent, not changing by scouring out in sudden rises and filling up on a falling river, the channel of the river must be straight for some distance above the station, and enough actual meter gaugings of the stream must be had, taken at the various stages between extreme high and low water, to render it possible to make a rating table showing the amount of water corresponding to a given reading on the gauge. As the cross section, unless in solid rock, will be subject to change, a new rating table must be made from time to time.

1. GAUGING STATION AT DEL NORTE, COLO.

The Del Norte gauging station is located some 3 miles above the town of Del Norte and is above the head-gates of all the large canals. It is said to be a good station, the cross section being quite permanent and the channel straight, so that the flow of water through the station is uniform. A large number of gaugings were made here in 1889 and 1890, and the records for those years are reliable. But one gauging was made in 1891, one in 1892, and none in 1893, while in 1894 but two were made, both in a small river. The records for these years are therefore not trustworthy as far as deduced actual flow is concerned. The Thirteenth Annual Report of the Survey gives, on page 94 of Part III, the flow up to and including 1892 and computes the annual run-off, both to an exactness hardly justified by the conditions. For 1893, 1894, and 1895 the survey publishes gauge readings only, and these, as well as the record for 1896 up to October 1, I have reduced to second-feet of flow and acre-feet of run-off by an approximate rating table which I made up from the few gaugings made since 1892 of which I have a record. This rating table and the gaugings on which it is based is given in the tables.

It is likely that the run-off shown in the table is, taken as a whole, within 20 per cent of the actual amount which has passed Del Norte since October, 1889, and possibly within 10 per cent.

You will notice that the summer flow largely exceeds the winter flow, but that the latter is much more constant than the former, and that the summer flow varies from a minimum of 330,000 acre-feet,

recorded in 1894, to about 715,000 acre-feet for 1891. Although the total summer flow for 1894 was less than that for 1896, it was distributed more uniformly through the irrigating season and so furnished a better supply for the ditches than did that of 1896.

Following the description of the different stations you will find the totals for each station grouped for convenience of reference.

2. GAUGING STATION AT EMBUDO, N. MEX.

The Embudo station was established in January, 1889. The choice of location is unfortunate, being in a sharp bend of the river, with a shingle bar on one side, which is likely to vary in height between high and low water. I have never seen this station in time of flood, but I should judge that the current must then vary greatly in different portions of the cross section. The record is not complete, no gauge readings having been taken for a greater portion of 1894. Numerous gaugings were made here in 1889 and 1890, and also in 1895 and 1896. These show some change between the two sets of gaugings, but not an excessive amount; and it is likely that the totals (see p. 86) for this station are within 20 per cent of actual amounts passing it.

You will notice a greater variation in the summer flow of the different years here than at Del Norte, the minimum recorded being that of 1896, when 275,000 acre-feet passed, although 1894 probably would have shown a smaller total flow, while the maximum is for 1891, when over 1,000,000 acre-feet is supposed to have passed.

3. GAUGING STATION AT RIO GRANDE, N. MEX.

The Rio Grande station, situated in the upper end of White Rock Cañon, is said to be the best station on the river. I have never seen it. This will become an important station if the water rights of the river below the cañon are ever adjudicated, as it will form the basis for distributing the water of the river the same as Del Norte now does for district No. 20, of Colorado. The rating table used for this station is approximate only. It is based on some ten or twelve gaugings which cover the range of the river from high to low water. They have all been made by Mr. P. E. Harroun, of Santa Fe, who established the station.

You will notice that the record for summer flow is here some 75 per cent more than at Embudo, only 35 miles above it. This addition is supposed to come from the streams entering the Espanola Valley, of which the Chama delivers the major portion of the water, but may be partly due to errors in the two rating tables, the Embudo one showing too small a flow and the Rio Grande one too large a flow.

A record has been kept for some time of the height of the water at San Marcial, but the channel is of so unstable a nature that nothing can be learned from the record.

4. GAUGING STATION AT EL PASO, TEX.

The El Paso station was first located at old Fort Bliss, 2 miles above El Paso and a short distance above the dam at the head of the Juarez acequia. Some time prior to 1889 a fairly permanent concrete dam was built at the head of that ditch, but prior to that construction it was merely a reef of small stones thrown into the river. A few weeks

after the gauging station was established this dam was raised about a foot, so changing the readings on the gauge.

The cross section at the station was such, being alluvial deposit, that it was subject to constant change, and only by a series of systematic measurements, carried through each rise and fall of the river, could a rating table be made up and corrected for each change of cross section which would give a volume of flow approximating at all closely to the water actually passing the station. This was done for 1889, and I think for a portion at least of 1890, and the records for those two years are reliable.

But while the gauging station was abandoned some time in 1890, so far as taking meter measurements was concerned, the readings on the gauge were still recorded, and the Thirteenth Annual Report, before referred to, gives, on page 94 of Part III, the flow in second-feet for this station for each month between 1890 and the dry river of 1892, carried to a degree of precision hardly justified by the conditions obtaining at the station. In a bulletin issued to cover the work of the hydrographers for 1893 and 1894, gauge readings are published for this station, and also a rating table, which is based, I suppose, on the meter gaugings of 1889 and 1890. While in the absence of any other information I have reduced the gauge readings by this rating table, I do not think that the results are at all reliable, and this should be borne in mind in any study of them. As the change, however, occurring most quickly is a sudden scour caused by a rising river, when much more water will pass the station than the gauge reading would indicate, it is likely that fully as much water passed the station as is indicated by the gauge readings except in time of low water. At that time the raising of the Mexican dam in 1891 is likely to so affect the gauge readings as to make them indicate more water passing than was actually doing so. As a mistake, however, of 1,000 second-feet in a flood for a day would balance one of 100 second-feet in low water for ten days (the flood being underestimated and the low-water flood overestimated), it is still likely that the run-off given in the table on page 86 is under rather than over the true amount.

This station was abandoned in June, 1893, and no attempt at a record was made until January, 1895, when a new station was established at the pumphouse belonging to the smelter some 3 miles above El Paso. This moved the gauge about a mile upstream, thus removing it from the immediate neighborhood of the Mexican dam, but in other respects the choice of location was an unfortunate one. A rock point juts into the river on the east side, against which the water strikes and rebounds, forming cross currents and eddies. There is a large rock in the middle of the channel just above the gauging station. The water pours over this in high water, but runs around it in low water. As a result the bottom of the gauging cross section scours out and fills up with great rapidity and through a large range of depth, a difference of 14 feet of water having been observed with only a difference of 0.8 feet on the gauge.

While this station was established nearly two years ago, but ten or twelve meter measurements have been made, all but one being during low water. The largest measured flow is about 1,000 second-feet or more. During October, 1896, a sudden flood came down the river. Mr. de Ibarrola took daily measurements of it, and these showed that the maximum was reached on October 19, when 5,900 second-feet was flowing, there being 4,000 the preceding day. The readings on the

gauge, however, showed an average of the same height for the two days and an extreme range between the two days of only 0.4 foot. So that I have not been able to make any reliable estimate of the flow through this station for 1895 and 1896, hence the table stops with 1893.

The records of these stations are here consolidated for convenience in comparison, all in acre-feet, to nearest thousand:

Time.	Del Norte.	Embudo.	Rio Grande.	El Paso.
May to September, 1889 (5 months).....				366,000
April to September, 1889 (6 months).....		578,000		
Winter, 1889-90.....	163,000	173,000		59,000
Summer, 1890.....	706,000	820,000		865,000
Winter, 1890-91.....	306,000	220,000		245,000
Summer, 1891.....	714,000	1,046,000		1,621,000
Winter, 1891-92.....	151,000	315,000		228,000
Summer, 1892.....	444,000	725,000		847,000
Winter, 1892-93.....	286,000	147,000		29,000
Summer, 1893.....	453,000	494,000		320,000
Winter, 1893-94.....	283,000	168,000		
Summer, 1894.....	332,000			
Winter, 1894-95.....	207,000	178,000		
Summer, 1895.....	545,000	687,000	1,113,000	
Winter, 1895-96.....	320,000	223,000	316,000	
Summer, 1896.....	360,000	275,000	488,000	

XXII. SUGGESTIONS.

This places before you the data available on which to base an answer to the two questions raised by Mr. Romero and Mr. Olney, and I will now give you my suggestions thereon, in accordance with your instructions:

First. Taking up the consideration of the summary for New Mexico, you will notice the following: Prior to 1880 there were 183,000 acres watered by 553 ditches, having a total capacity of 5,600 second-feet. While the number of ditches increased to 573, adding, however, 50 second-feet to the capacity, this area slowly decreased to 180,000 acres watered in 1884. Then it suddenly fell to 173,000 acres in 1885, this fall being due to three ditches, with an aggregate capacity of 130 second-feet, being washed out and entirely abandoned, while others were badly injured by the great flood of 1884. The area cultivated remained practically constant until 1889, although some 18 new ditches, with an aggregate capacity of 120 second-feet, were built in the interim. In 1890 the acreage commenced to increase, and in 1895 it reached a total of 187,000 acres, the same amount being watered in 1896. It is likely that a slightly increased area will be watered in 1897.

The total number of ditches in use in 1896 was 603, with an aggregate carrying capacity of 6,060 second-feet, or an increase over 1879 of 50 ditches carrying 450 second-feet of water. These tables show, however, that while the number and aggregate capacity of the New Mexico ditches has increased nearly 10 per cent since 1879, the acreage has increased but 2 per cent since that year, falling in the interval between 1879 and 1896 to a minimum area, which was nearly 6 per cent below that of 1879.

An examination of the detail sheets for New Mexico districts will disclose the fact that a large percentage of the irrigation is ancient. Over 75 per cent of it dates back to 1860, while 20 or 30 per cent is of unknown age, but over 100 years old. The different tribes of Pueblo Indians now cultivate about 20,000 acres in the Rio Grande drainage.

In view of these statistics, I would suggest that the injury claimed

to have been done to the El Paso Valley by recent diversions of the waters of the Rio Grande has not come from an increased use of water in New Mexico.

Second. Taking up the consideration of the summary for Colorado and referring also to the detail sheets of each district, you will observe the following:

The earliest settlement in the San Luis Valley, judging from the date of the decree, was made in 1852. In 1870 the settlements had increased until there were some 147 ditches in use, with an aggregate capacity of about 1,300 second-feet, and these watered 50,000 acres of land.

In 1879 the use of water had there extended to the irrigation of 122,000 acres, served by 571 ditches, with a probable aggregate capacity of 3,500 second-feet and which were afterwards granted decrees which amounted to 3,700 second-feet.

This area, together with the number of ditches and the total carrying capacity thereof, increased steadily up to 1890, when ditch construction stopped, although some were afterwards enlarged. Then the total number of ditches had reached 925, with a capacity of about 9,500 second-feet (afterwards increased to about 10,000 second-feet) and decrees amounting to 11,700 second-feet. In 1890 these ditches served over 300,000 acres, the acreage having increased at a moderately uniform rate from 1879. The next two years saw a large increase, over 350,000 acres being watered in 1891 and nearly 400,000 in 1892. The latter was the year of maximum acreage, the amount falling back to 350,000 acres in 1893 and 340,000 acres in 1894. In 1896 there were 925 ditches in use, with a total capacity of 10,000 second-feet or more, 877 of these having decrees aggregating over 12,200 second-feet, and they served 320,000 acres of land. The short water supply of 1896 cut down the area watered in 1896, so that the area of 1894 (viz, 340,000), which was also the area of 1895, is probably the normal amount for the valley. It is likely to become greater rather than less from year to year, although no new ditches will be built, nor will there be any great increase of acreage served directly with water, because all of the supply available for direct irrigation is now in use. The construction of reservoirs, a subject taken up later on, may some time add water enough to the direct supply to serve some 30,000 acres, and that amount may in the future be added to the area now tilled.

These totals show a permanent increase of about 220,000 acres over 1879, or an increase of nearly 200 per cent in the area under cultivation, and nearly that increase in the use of water in Colorado since 1879. This result is deduced in acres of land rather than in acre-feet of water, because the amount of water varies so greatly in different years on the same area of land that it is misleading to quote acre-feet without an accompanying study of the special conditions obtaining the year when the amount quoted was used. Later on I will analyze more fully the effect of this increased use of water. Here I would suggest that this general proposition is established by a study of the Colorado statistics, viz:

The El Paso Valley, as well as the valleys on the river, as far north in New Mexico as Albuquerque, have suffered from the increased use of water in Colorado.

Third. Taking up the consideration of the flow of the river, before and since the construction of the Colorado ditches.

There are no gauge records of flow which antedate the end of the construction period in Colorado. Reference to Section XIX will show

you all the general information I was able to gather concerning the flow. From this and the records of gaugings already discussed you will see—

A. That the river went dry many years before the large use of water in Colorado began. The records show that in 1851 it was dry as far north as Socorro, N. Mex. Again in 1860 or 1861 it was dry in the Mesilla Valley, and 1879 was the driest year of record prior to 1889, the flow ceasing nearly or quite as far north as Albuquerque. In 1889 it was dry for over four months at El Paso, and this dry river was continuous farther north than Albuquerque.

B. That since 1889 the river has been low at El Paso every year except one (1891) and dry nearly every year, although 1889 still has the record for the longest drought. In 1896 the water failed earlier than ever before, the flow, which had been small all winter, ceasing May 26; but the copious summer rains on the New Mexico drainage of the river sent down water in July, and its flow was intermittent after that date.

C. That floods are not so frequent as in former years, the last destructive one occurring in 1884. There was a small one in 1891, but it was not so large as was that of 1884.

There are so many different climatic conditions obtaining in the various sections of so large an area as the one under consideration that it is difficult to draw general conclusions from a study of these conditions. In 1889, for instance, the records show a large volume of water in the river at Del Norte and the channel dry from Albuquerque southward, while in 1894, with a very small amount in the river in the San Luis, it did not go dry at Albuquerque, but was dry thirty days for a long distance below there, and was not dry for any length of time in the Mesilla Valley. The absence of the usual summer rains in New Mexico accounts for the condition of 1889, while heavy precipitation in the southern country accounts for that of 1894. While these explanations are satisfactory, the conditions in these two years show that it is impossible to foretell the condition of the river at El Paso from the Colorado snowfall and the subsequent spring and summer flow at Del Norte.

Another condition which probably affects the time, duration, and volume of the spring run-off from the mountain country is as follows: In the past ten or fifteen years there have been large areas of forests destroyed on the head waters of the Rio Grande either by fire or by the ax of the lumberman. It is commonly believed that this denuding of the hills causes the snow to melt much more rapidly in the spring than it did when protected by the timber, so that its water quickly leaves the mountains instead of being held back until the summer when it is needed for irrigation. Not only is this true, but it is quite likely, as suggested by Colonel Mills, that what may be called the dry evaporation of snow from these bare hillsides is also a potent factor in the diminution of the water supply. It is a well-known phenomenon in the arid region of the mountains to see a snowfall of several inches disappear from the open plains in two or three days when the temperature has remained constantly below the freezing point, but the sun has been bright and the wind strong, while at the same time the snow which was protected from the wind and sun is practically undiminished in quantity. So it may be that high up on the mountain sides the heavy snows of winter, which, formerly protected by the dense foliage of the fir and spruce, remained until

late spring, are now, falling as they do on the barren hillsides which have been denuded of their timber, largely evaporated and dissipated in the air long before the warm days of spring come. From this it is easy to infer the necessity of conserving what forest areas still remain in the mountains.

On the foregoing I would base the suggestion that the dry rivers at El Paso are not always caused by the increased use of water in the United States, but that this use has increased the frequency of recurrence thereof and the lengths of their duration, as will appear more fully from the following discussion. Before entering upon that discussion, however, I would also suggest: So many different and varying conditions simultaneously affect the flow of the Rio Grande that it is difficult to say just what change in this flow is due to a radical and permanent change in one of these conditions, the others still constantly changing as before.

Fourth. Taking up a detailed consideration of the effect on the river of the Colorado use of water. The conditions we have to consider are: A long river flowing sluggishly through a wide and sandy bed, with a minimum flow at the lower end of the stretch under consideration but little, if any, more than sufficient in years of ordinary low water to supply the demands thereof, and it is asked what effect will doubling the amount of water used on its head waters have on its lower reaches, the irrigation on its head being already some two-fifths of the total of the river. The answer must be that the minimum flow lower down will be decreased. The question may be considered more in detail as follows:

In studying the effect on the Rio Grande of diverting its waters in the San Luis Valley, only those areas should be considered which are irrigated by water taken from those streams whose flow enters the main river. This condition segregates all of districts 25, 26, and 27, and should also reject a small percentage of districts 20 and 21. But the area that would be rejected in the latter districts is small and would not materially affect totals. Therefore, in the following discussion all land watered in the valley will be considered except that in districts 25, 26, and 27.

While much more water will be used in a year of plenty than in one of scarcity, it is the effect on the river of the use of water when the supply is short that we wish to obtain, and so our attention should be directed to the use of water in those years alone. The seasons of 1894 and 1896 shows the shortest water supply of any years of which we have a reliable record in the San Luis, and I think it will be a fair consideration of the problem to confine our computations to those two years, and to obtain, if possible, an estimate of the amount of water diverted from the river during these two years in excess of what would have been used if the same area had been watered in 1894 and 1896 as it was irrigated prior to 1880.

Deducting from the totals for prior to 1880, 1894, and 1896 the area and water charged to districts 25, 26, and 27 there remains:

Year.	Acres.	Acre-feet.
Prior to 1880.....	60,775	240,100
1894.....	272,865	536,365
1896.....	248,790	418,270

Now, you will see that the area prior to 1880 was charged with nearly 3.5 acre-feet of water per acre, but it is not likely that, even had that small area been watered in 1894 and 1896, it would have used that much water. In district 20, I found that the smaller ditches used an average of 3 feet in 1896—and it will be fair to assume that the 70,000 acres of old land used that amount of water per acre in 1894 and 1896—or 209,325 acre-feet were used on it. Then we have, deducting the acreage and above amount of water from the totals above, for 1894, 203,090 acres new land, using 319,940 acre-feet of water, and for 1896, 178,815 acres of new land, using 208,955 acre-feet of water. The mean of the two is about 192,000 acres of new land, using 264,000 acre-feet of water in excess of the land and water use which antedates 1880.

This 264,000 acre-feet equals about 1,300 second-feet flowing one hundred days. This is about the length of time the irrigation season lasts in the San Luis Valley. Hence, making all due allowance for water charged twice, seepage return, both present and prospective, the probable overestimate of acreage made by owners who wish their ditches to make a good showing, and the errors in guessing at the amount of water flowing in the different ditches by men whose notions of a cubic foot of water are pretty hazy, and who are almost sure to overestimate a stream, it is safe to say that the low-water flow of the Rio Grande in dry years has been decreased by the new irrigation of the San Luis an amount equal to at least 1,000 second-feet of water flowing for one hundred days, and as the probable future seepage returns is likely to be nearly or quite all offset by increased acreage, that the river has permanently lost this amount of water.

As the evaporation and percolation in the river's channel will remain practically constant from year to year from Colorado to Texas, provided there is any water in it at all, and as the use of water in New Mexico, when any is to be had, is about constant also, this taking 1,000 second-feet from the river in Colorado means taking practically that much from the flow at El Paso. And as the San Luis season begins some time in the latter part of April, while the largest use of water is in May and June, and as it probably takes water twenty to thirty days to travel from there to El Paso, it is seen that the San Luis maximum diversion of water in May or June would most greatly affect the river at El Paso in June or July, months when the water supply is likely to begin to fail. The July use of water in the San Luis, which is quite large, would be felt at El Paso in August.

While this discussion indicates that the mean summer flow at El Paso has probably been decreased 1,000 second-feet at least, and perhaps more, by the increased use of water in Colorado, it does not mean that there was no more water diverted in Colorado than was used prior to 1880 1,000 second-feet would be running in the river at El Paso when it is now dry, because it might go dry without any water being used in Colorado, as it did in 1851 and 1861. It means that the average summer flow would be 1,000 second-feet, or thereabouts, larger than it now is.

What proportion this amount bears to the whole flow of the river is not material to this discussion, as it is the effect of its diversion on the minimum flow at El Paso we wish to obtain, and not what per cent of annual flow is used in Colorado.

The question may occur to you, Why, since the Colorado use of water increased rapidly prior to 1889, was no disastrous effect felt at

El Paso before that date? The answer is: The years of 1883, 1884, 1885, and 1886 were all years of heavy snowfall in Colorado, and, so far as I know, of average summer rainfall lower down the river, so that there was a large amount of surplus water. And while the acreage has largely decreased since 1892 in the San Luis, the snowfall has been scanty for three years past, and the water supply is short, so that no beneficial effect resulting from this decreased acreage has been felt at El Paso. If the coming years bring more snow, the area watered in the San Luis will probably increase again, as it is now limited by the water supply being exhausted, and not by there being no more available land.

The condition, therefore, to be considered at El Paso is that of a dry river likely to recur every year. The suggestions I would make, which are based on this discussion, are already formulated and presented in their proper places.

Before considering the remedy for this condition, I will give you data as to storage project, completed, proposed, or probable, in the drainage above El Paso.

XXIII. RESERVOIRS.

On the last sheet of the tabulated matter I have listed 4 reservoirs, constructed in the Rio Grande drainage, with an aggregate capacity of 31,300 acre-feet; 4 projected, with an aggregate capacity of about 300,000 acre-feet, and 6 possible sites, with an aggregate capacity of about 430,000 acre-feet. This I will consider in detail further on.

In the winter of 1889-90 I was employed by the United States Geological Survey to reconnoiter and report on all the possible reservoir sites in the drainage of the Rio Grande, so that the public lands lying within their limits might be withdrawn from sale. My instructions were to report all possible sites without regard to the water supply, land available for irrigation, or cost per acre-foot of water stored. Under these instructions I reconnoitered and reported 52 sites, including the El Paso site, with an aggregate estimated capacity of over 2,000,000 acre-feet, or about 1,500,000 acre-feet aside from the El Paso site. A number of these have since been platted on the General Land Office map of New Mexico and shown on the published copies thereof as Government reservoir sites.

But one of the number has been improved. This is the one on the head of the Blue Water in the Puerco drainage, No. 33 on the General Land Office map.

While these sites exist as reported by me to the Geological Survey, and it is physically possible to make a reservoir of each one, the adverse conditions surrounding nearly all either as to scanty water supply, no available land on which to use the water, probable excessive cost of site, or of the necessary dam, are such as to preclude all probability of their construction. Specific statement of the reasons leading me to this conclusion in the case of each site condemned would be beyond the scope of this report.

Quite a large number of reservoir filings have been made on sites said to exist around the San Luis Valley. Being familiar with the conditions under which nearly all of these filings were made, I have no confidence in their being built, and so have listed none of those filed on as "projected," except Santa Maria lakes, although two are included under possible sites.

A. RESERVOIRS ALREADY BUILT.

1. *Saguache*.—This is in district 26, Colorado, and was built by the State. The water supply is scanty, and in its present condition the reservoir will not hold what water does enter it, the bottom being porous. None of the water to be diverted into this reservoir ever reaches the river, so that its construction has not affected the water supply of the Rio Grande. Its capacity is said to be 1,200 acre-feet.

2. *Cove Lake*.—This lies in district 22, Colorado, and is filled by surplus waters from Conejos and San Antonio rivers. Water diverted to it would otherwise enter the Rio Grande. While the capacity of the lake is 9,700 acre-feet, there is not land enough under it to utilize more than a third of this amount, so that the reservoir should be charged with a probable draft on the drainage of not over 4,000 acre-feet.

3. *Santa Fe*.—This is built above Santa Fe. The water it impounds would otherwise be used for irrigation, as the stream has not for many years delivered any water to the river, except in time of flood. This reservoir serves as an equalizer, distributing the use of water more uniformly throughout the year. Its capacity is 4,000 acre-feet. It can be omitted from the discussion.

4. *Blue Water*.—This is a Government reservoir site No. 33, and is built on Blue Water Creek, in the Zuni Mountains, to a capacity of 20,000 acre-feet. It can be made to hold 70,000 acre-feet, but the water supply is uncertain. It stores no water that would ever reach the Rio Grande, and so may be omitted from the discussion.

B. RESERVOIRS PROJECTED WITH A FAIR PROSPECT OF CONSTRUCTION.

1. *Santa Maria Lakes*.—This site is in district 20, Colorado, near the head waters of the Rio Grande. If utilized, it will furnish water for one of the large canals in the San Luis Valley. All of its capacity of 20,000 acre-feet would be drawn from water which would otherwise flow down the river.

2. *Mormon*.—This site is in district 22. It may never be built, but I thought it possible that it might be, and so listed it. All of its capacity of 20,000 acre-feet would be drawn from water which would otherwise flow down the Conejos.

3. *Western Homestead Land and Investment Company's Reservoir*.—This site lies northwest of Albuquerque and would be filled from the flood waters of the Puerco. While it would draw a supply from the sudden summer floods of this river, much of which water would otherwise sink away into the sand, it must be considered as menacing 20,000 acre-feet of flow, as this is its capacity.

4. *Elephant Buttes*.—This is a large reservoir site on the Rio Grande west of the Jornada del Muerto. The dam site and main part of the reservoir site lie on the Pedro Armendaris Grant No. 33, to which the United States has given patent. The projectors claim 235,000 acre-foot capacity with an 80-foot dam. I reconnoitered the site on October 7 and estimated its capacity to be 230,000 acre-feet with a 100-foot dam. This must be considered for the reason that, while its construction is not at all assured and may not even be a future probability, its effect, if built, on the flow of the river would be very serious, and so it should be carefully studied.

C. RESERVOIR SITES WHICH MAY BE IMPROVED AT SOME FUTURE TIME.

1. *La Jara Meadows*.—This site lies on the head of La Jara Creek, in district No. 21, Colorado. This is a fine site, with large capacity, but the water supply is not abundant, as the tributary drainage area has an extent of only some 40 or 50 square miles and is not likely to furnish over 20,000 acre-feet. This amount is assumed as the capacity. The site is now occupied by hay ranches. All the water stored would otherwise flow down La Jara Creek, but much of it would sink away into the La Jara artesian basin. Assume that one-half of the above amount, or 10,000 acre-feet, may some time be stored here, which would otherwise reach the main river.

2. *Elk Creek Meadows*.—This site is on a tributary of the Conejos River, in district 22, Colorado. It, together with one on Pinos Creek, are now filed on by some parties who are using them for fishing purposes with no intention of utilizing them for storage reservoirs. Its whole capacity of 8,000 acre-feet would form a draft on the surplus waters of the Conejos.

3. *Pinos Creek Meadows*.—This site is on a tributary of San Antonio River, in district 22, Colorado. Its capacity is 5,000 acre-feet, which would form a draft on the surplus waters of the San Antonio.

4. *Brazos Lakes*.—This site is on the head of the South Fork of the Brazos River, in the Chama drainage on the New Mexico land grant of Tierra Amarilla. If ever improved, it will be for the purpose of storing water to be used on the mesa around Parkview. Its whole supply will be taken from the surplus waters of the Chama drainage. The total capacity could be made 50,000 acre-feet, but the available water supply is not likely to exceed 20,000 acre-feet, and this amount must be considered.

5. *Hot Springs*.—This is Government reservoir site No. 37 and is a fine site, but with a water supply which must come from rains rather than from snow, and is, therefore, uncertain. It is near the head of Alamoso Creek, in district 11, New Mexico. This stream is one of those which cut down into the Cuchilla Negra Mesa. Practically its whole supply would be taken from the surplus waters of the Rio Grande. Its maximum capacity is 36,000 acre-feet, but its drainage area is not likely to furnish over 20,000 acre-feet. This amount must be considered as a possible draft on the waters of the Rio Grande.

6. *Old Fort Craig*.—This is Government site No. 38, and lies on the Rio Grande west of the Jornada del Muerto and some 35 miles above the Elephant Buttes site. With an 80-foot dam I estimated its capacity to be 360,000 acre-feet. This would, of course, all be drawn from the surplus waters of the river. It is not likely that both this and the Elephant Buttes reservoir would ever be built, as either will store a supply of water amply sufficient to serve all the available land.

This list comprises all the sites which I think are likely to be occupied. Those outside of the main valley of the river which will impound water that would otherwise enter the Rio Grande will, if built, withhold from it an aggregate of 127,000 acre-feet.

XXIV. WATER SUPPLY FOR EL PASO RESERVOIR.

In accordance with your letter of instructions, in which you request from me any suggestions that may occur to me bearing on the problem under consideration, I add the following discussion of the probable water supply for the El Paso reservoir:

The first problem is to determine how much water will be needed each year. As before stated, the arable land in the valley is about 95,000 acres. This includes the good valley lands on both sides of the river. Under the hot sun of this valley 2 acre-feet of water are needed for each acre of land in order to produce a crop, or 190,000 acre-feet must be furnished the valley for irrigation. The area of the proposed lake, when it is full, if the dam be built 60 feet high above the river bed, is, in round numbers, 25,000 acres, while the evaporation from a pan placed in the river was found to be about 7 feet during the year 1889. I do not think that the evaporation from so large an area of water as would be formed by this lake would be over one-half this amount per year. In 1889 I estimated that the evaporation would be as much from the lake as from the pan; but I now believe that estimate to have been in error. The longest time that water would have to be stored, unless carried over from one year to the following, would be four to six months. So that, even if the daily evaporation were as great from the lake as from the pan, the total loss by it from the stored water would only equal half the annual evaporation. As it is not at all likely that the rate of evaporation from the lake will exceed one-half that from the pan, an allowance of 3 feet over the whole surface for the loss from evaporation during the time stored water is held, is probably ample, or 75,000 acre-feet might be so lost.

The first time the reservoir was filled the seepage would be great, as stated in my former report; but after the first or second filling loss from this source would become so small as to be safely ignored.

An available supply must therefore be in sight of 190,000 acre-feet of water for the service of land and 75,000 acre-feet for evaporation, or 265,000 acre-feet in all, and must be likely to remain in sight to render safe the water supply of this reservoir. In my report to Col. Anson Mills, made in 1889, I estimated the capacity of this lake to be 535,000 acre-feet. Hence, remembering that evaporation would be greater for the longer time that stored water would have to be held, you will see that until sediment filled a portion of it the reservoir will hold sufficient water to supply the demand on it for about two years. This filling will occur, however, and hence reliance can not be safely placed on this storage capacity, but water enough ought to be in sight each twelve months for the necessities of the coming twelve, leaving the extra storage room as an element of safety.

Recurring to the meager records of the flow at El Paso (see p. —), you will see that the flow for the eleven months prior to March 31, 1890 (this time including the long drought of 1889), was 425,000 acre-feet; for the year ending March 31, 1891, it was 1,100,000 acre-feet; for the year ending March 31, 1892, it was 1,850,000 acre-feet; for the year ending March 31, 1893, it was 875,000 acre-feet.

April, 1889, was, I think, a month of heavy flow, being nearly, if not quite, as large as was May, when 190,000 acre-feet passed El Paso. Assuming that 150,000 acre-feet passed in April, the flow for the first year in the above table becomes 575,000 acre-feet and the mean 1,100,000 acre-feet. It is the minimum, however, and not the mean, that we must consider. The 575,000 acre-feet above given is that minimum, so far as the records go. Reference to the Embudo records show that the river there carried less water during the year ending March 31, 1894, than for any other year, the record not including the flow for the year ending March 31, 1895. At Del Norte the minimum was for the year ending March 31, 1895, when it was 30 per cent less than for any other year. There was water all the season, however, at El

Paso the summer of 1895, so that either 1890, 1894, or 1896 must be the year of minimum flow here.

Judging from the looks of the gauge readings for the two years prior to October, 1896, all efforts to reduce them to any definite quantity having been futile, I should judge that the flow for the year ending March 31, 1896, was something like 700,000 or 800,000 acre-feet, nearly all of this passing during the first three months of the time included, while I should estimate that 200,000 acre-feet or more had passed in the seven months prior to October 31, 1896. There was practically no flood in the spring of 1896. This accounts for the small flow given. If the same conditions should prevail for the coming five months, the annual flow may not exceed 300,000 acre-feet. Heavy snows are already falling in Colorado, however, and there is every reason to expect a good flow in the river next spring. The conditions are now, in my opinion, at their worst, and can change but to mend. While this minimum flow may last for the balance of the year, it is not likely.

I therefore think it safe to say that at least 400,000 acre-feet of surplus water is likely to be in the drainage of the Rio Grande some time during every year, and would pass El Paso if no drafts for storage were made on it.

Reference to the closing paragraph of the discussion of reservoir sites shows a possible future draft on this surplus water from the use of reservoir sites outside of the valley of the Rio Grande of 127,000 acre-feet, while either the Fort Craig or the Elephant Buttes reservoir has still to be considered. This will leave about 275,000 acre-feet available, provided neither of the latter reservoirs are built, for the El Paso reservoir, in what may be termed a mean year of minimum flow, with a possibility of its falling to 200,000 acre-feet in an excessively low year. Unless two consecutive years are excessively dry, however, dependence may be placed for many years on the extra storage capacity of the reservoir.

So that a minimum annual flow of even less than 300,000 acre-feet, with all of the reservoirs mentioned built, except the Elephant Buttes and Fort Craig, would not mean a loss of crops in the El Paso Valley.

I would therefore suggest that the water supply is likely to be sufficient for the El Paso reservoir, provided no large storage reservoirs are constructed above it on the main river, but without any restrictions of probable reservoirs on the tributaries.

XXV. CONCLUSION.

As several times before stated, the statistics on which the assumptions and inferences deduced in this paper rest are approximate only. Their probable error ranges from 10 to 20 per cent for areas watered, from 10 to 30 per cent for amount of water used, and from 10 to 30 per cent or more for the flow of the Rio Grande, the largest error in the last-named case relating to flood discharge, when for our present purpose an error is of little importance.

Notwithstanding this large possible element of error in the premises, I think it safe to say that the suggestions I have made and the opinions I have expressed, either directly or by implication, are well supported by the evidence, are safely conservative, and are the most probable ones to be derived from a careful study of all the information at hand. Their recapitulation is as follows:

1. The fact of a decrease in the flow of the river at El Paso exists, as claimed, and dates back to 1888 or 1889. Before those years the river went dry at intervals of about ten years. Since 1888 it has been dry every year but two.

2. The use of water for irrigation has not materially increased in New Mexico since 1880, and hence is not the cause of this decreased flow.

3. The use of water in the San Luis Valley of Colorado has very largely increased since 1880, and at the present stage of development it takes from the river in excess of what was taken in 1880 an amount of water equivalent to a flow of 1,000 second-feet, running for one hundred days; at least this amount is taken, and possibly more.

4. It is impossible to state specifically how much water was in the river prior to this increased use of water and since, as the records do not antedate this increased use, and as the flow since the records began varies within very wide limits.

5. This flow of 1,000 second-feet, if allowed to remain in the river, would do much toward preventing a dry river at El Paso, hence:

6. The Mexican and American citizens of the El Paso Valley have suffered in common with their neighbors of the Mesilla Valley and those still farther up the river by this Colorado increased use of water. The suffering has been greater in the El Paso Valley than elsewhere.

7. All of the summer flow of the streams in the San Luis Valley, except their flood waters, are now appropriated, and therefore the use of water therein for direct irrigation is not likely to materially increase in the future.

8. Storage reservoirs may be built outside of the main valley of the river, with an aggregate capacity of about 125,000 acre-feet. One of some 230,000 acre-feet capacity is projected in the river's valley above El Paso.

9. There are some 95,000 acres of arable land in the El Paso Valley, about equally divided between the United States and Mexico. To supply a reservoir with water sufficient for the irrigation of this land, together with the amount that will be evaporated from the surface of the reservoir, will require about 265,000 acre-feet of water each year.

10. While there is a possibility of a year's flow past El Paso going below 300,000 acre-feet before deducting the amount that can be stored above there, outside of the river's valley, the likelihood is that it will never ordinarily go below 400,000 acre-feet in a dry year. If from the latter amount is taken the 125,000 acre-feet which can be stored outside of the river's valley, there remains 275,000 acre-feet available for the El Paso reservoir. Hence,

11. The water supply is likely to be sufficient for the El Paso reservoir after deductions are made for all the probable storage schemes except that one above the Mesilla Valley. But,

12. There is not a sufficient water supply in sight to serve both the Elephant Buttes and El Paso reservoirs, and one scheme must give way to the other. If the United States Government can find any way to control the storage of water at Elephant Buttes, such control should be exercised. If that dam is built at all, its use of water should be conditional on its stopping no flow when the supply of water at El Paso is short.

Yours, truly,

W. W. FOLLETT,
Civil Engineer.

DISTRIBUTION OF WATERS OF THE RIO GRANDE.

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Winter flow of the Rio Grande at Del Norte, Colo.

[From Geological Survey records. Area contributing run-off, 1,400 square miles.]

Month.	1889-90.		1890-91.		1891-92.		1892-93.	
	Second-foot.	Acre-foot.	Second-foot.	Acre-foot.	Second-foot.	Acre-foot.	Second-foot.	Acre-foot.
October	280	17,360	470	29,140	845	52,390	390	16,130
November	320	19,200	480	28,800	375	22,500	360	21,600
December	280	17,360	565	35,030	325	20,150	920	57,040
January	531	34,100	990	61,380	* 306	18,600	1,170	72,540
February	795	44,520	1,285	72,530	* 306	17,400	* 1,200	67,200
March	485	30,070	1,280	79,360	315	19,530	* 1,000	62,000
Total		162,610		306,230		150,570		296,500

Month.	1893-94.		1894-95.		1895-96.	
	Second-foot.	Acre-foot.	Second-foot.	Acre-foot.	Second-foot.	Acre-foot.
October	300	18,000	345	21,300	420	26,040
November	340	20,400	270	16,200	325	19,500
December	795	49,200	300	22,330	945	58,560
January	1,210	75,020	845	52,300	1,370	84,940
February	1,300	67,200	970	54,320	1,230	71,140
March	1,015	62,930	650	40,300	1,115	69,130
Total		296,440		206,630		329,340

* Estimated.

Summer flow of the Rio Grande at Del Norte, Colo.

[From Geological Survey records.]

Month.	1890.		1891.		1892.		1893.	
	Second-foot.	Acre-foot.	Second-foot.	Acre-foot.	Second-foot.	Acre-foot.	Second-foot.	Acre-foot.
April	910	54,600	1,410	84,600	1,045	62,700	690	41,400
May	4,330	268,400	3,285	203,670	2,605	161,510	2,950	182,900
June	3,895	228,300	4,145	248,700	2,185	131,100	2,525	151,500
July	1,515	93,930	1,690	104,780	740	45,880	520	32,240
August	610	37,820	965	41,230	445	27,500	410	25,420
September	385	23,100	525	31,500	260	15,600	325	19,500
Total		706,210		714,480		444,380		452,960

Month.	1894.		1895.		1896.	
	Second-foot.	Acre-foot.	Second-foot.	Acre-foot.	Second-foot.	Acre-foot.
April	890	51,000	2,115	126,900	1,535	92,100
May	2,510	155,620	2,185	136,090	2,575	159,650
June	980	58,800	2,490	149,400	800	48,000
July	355	22,010	980	60,700	385	23,870
August	380	23,560	725	44,950	260	16,120
September	345	20,600	450	27,000	480	28,800
Total		332,190		545,100		368,540

Rating table by which the above table for 1893, 1894, 1895, 1896 was computed in second-feet.

[Actual gaugings in black-face figures.]

Feet.	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
1	150	165	185	210	235	260	300	350	415	490
2	550	610	670	730	790	850	910	970	1,040	1,120
3	1,210	1,310	1,420	1,545	1,685	1,840	2,010	2,195	2,395	2,600
4	2,820	3,060	3,320	3,600	3,900	4,220	4,560	4,920	5,300	5,700

Winter flow of the Rio Grande at Embudo, N. Mex.

[From Geological Survey records. Area contributing run-off, 7,000 square miles.]

Month.	1888-89.		1889-90.		1890-91.		1891-92.	
	Second-foot.	Acre-foot.	Second-foot.	Acre-foot.	Second-foot.	Acre-foot.	Second-foot.	Acre-foot.
October			280	17,360	590	34,720	1,680	104,160
November			365	21,900	615	36,900	775	48,500
December			549	33,480	645	39,900	550	34,100
January	430	26,600	435	26,970	585	36,270	495	30,600
February	475	29,600	555	31,080	615	34,440	565	31,510
March	785	48,670	680	42,160	915	56,730	1,050	65,100
Total		* 101,930		172,950		239,050		315,000

Month.	1892-93.		1893-94.		1894-95.		1895-96.	
	Second-foot.	Acre-foot.	Second-foot.	Acre-foot.	Second-foot.	Acre-foot.	Second-foot.	Acre-foot.
October	200	12,400	485	30,070	+ 380	23,560	495	30,600
November	315	18,900	+ 450	27,900	+ 400	24,000	610	36,600
December	325	20,150	445	27,500	+ 430	26,600	520	32,240
January	450	27,900	435	26,870	480	29,700	535	33,170
February	535	29,900	450	28,200	490	27,440	545	31,610
March	605	37,510	+ 500	31,000	700	47,120	955	59,110
Total		146,820		167,830		178,540		223,430

* Three months.

+ Estimated.

Summer flow of the Rio Grande at Embudo, N. Mex.

[From Geological Survey records.]

Month.	1889.		1890.		1891.		1892.	
	Second-foot.	Acre-foot.	Second-foot.	Acre-foot.	Second-foot.	Acre-foot.	Second-foot.	Acre-foot.
April	2,260	135,600	2,080	121,800	2,370	142,200	2,980	178,800
May	3,430	212,600	4,960	307,520	5,965	369,850	4,880	303,180
June	2,920	175,200	4,105	246,300	5,040	312,400	3,145	188,700
July	470	29,140	1,590	98,580	2,355	146,010	535	33,170
August	205	12,710	815	50,530	630	57,660	190	11,780
September	210	12,600	545	32,700	470	28,200	150	9,000
Total		577,910		860,430		1,046,300		724,600

Month.	1893.		1894.		1895.		1896.	
	Second-foot.	Acre-foot.	Second-foot.	Acre-foot.	Second-foot.	Acre-foot.	Second-foot.	Acre-foot.
April	1,370	82,200			2,580	154,800	1,795	107,700
May	3,125	193,750			2,635	163,570	1,000	60,200
June	2,540	152,400			3,625	181,500	370	22,200
July	330	20,460			1,335	82,770	300	18,600
August	340	21,080			1,070	66,340	220	13,600
September	405	24,300	* 155	9,300	635	38,100	230	13,900
Total		404,190				686,880		275,140

* Estimated.

Rating table by which the above table for 1893, 1894, 1895, and 1896 was made up.

Feet.	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
7.....	125	155	185	215	245	275	310	345	380	420
8.....	460	500	540	580	620	660	700	750	800	850
9.....	900	960	1,020	1,080	1,160	1,240	1,330	1,430	1,540	1,650
10.....	1,700	1,870	1,980	2,100	2,220	2,350	2,470	2,590	2,720	2,850
11.....	2,980	3,110	3,240	3,380	3,520	3,660	3,800	3,940	4,080	4,220
12.....	4,300	4,520	4,660	4,800	4,940	5,080	5,240			

DISTRIBUTION OF WATERS OF THE RIO GRANDE.

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Winter flow of the Rio Grande at Rio Grande Station.

[From the Geological Survey records. Area contributing run-off, 11,000 square miles.]

Month.	1894-95.		1895-96.	
	Second feet.	Acre- feet.	Second feet.	Acre- feet.
October			705	43,710
November			835	50,100
December			710	44,020
January			* 760	47,120
February			* 790	45,820
March	1,370	84,940	1,370	84,940
Total		+ 117,080		315,710

* Estimated.

+ Two months.

Summer flow of the Rio Grande at Rio Grande Station.

[From the Geological Survey records.]

Month.	1895.		1896.	
	Second feet.	Acre- feet.	Second feet.	Acre- feet.
April	5,070	304,200	3,480	208,800
May	4,615	286,130	2,710	168,020
June	4,630	277,800	580	34,800
July	1,770	109,740	440	27,280
August	1,480	91,760	195	12,080
September	720	43,200	590	36,580
Total		1,112,830		487,570

Approximate rating table from which the above is computed.

Feet.	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
4		205	305	345	390	435	480	530	580	630
5	680	730	780	830	880	940	1,005	1,080	1,160	1,250
6	1,340	1,440	1,550	1,670	1,800	1,930	2,070	2,210	2,350	2,490
7	2,640	2,790	2,940	3,090	3,250	3,410	3,570	3,730	3,900	4,070
8	4,250	4,430	4,620	4,820	5,030	5,250	5,470	5,700	5,930	6,180
9	6,430	6,680	6,940	7,200	7,470	7,750	8,040	8,330	8,630	8,930

Winter flow of the Rio Grande at El Paso, Tex.

[From Geological Survey. Area contributing run-off, 30,700 square miles.]

Month.	1889-90.		1890-91.		1891-92.		1892-93.	
	Second- feet.	Acre- feet.	Second- feet.	Acre- feet.	Second- feet.	Acre- feet.	Second- feet.	Acre- feet.
October	Dry.	0	65	4,030	1,485	92,070	Dry (?)	-----
November	Dry.	0	285	17,100	340	20,400	Dry (?)	-----
December	70	4,340	535	33,170	345	21,300	Dry (?)	-----
January	195	12,090	450	27,900	325	20,150	135	8,370
February	290	16,240	810	45,360	475	27,550	140	7,840
March	425	26,350	1,865	115,630	750	46,500	* 200	12,400
Total		59,020		243,190		228,000		28,610

* Estimated.

Summer flow of the Rio Grande at El Paso, Tex.

[From Geological Survey reports.]

Month.	1889.		1890.		1891.		1892.		1893.	
	Sec- ond- feet.	Acre- feet.	Sec- ond- feet.	Acre- feet.	Sec- ond- feet.	Acre- feet.	Sec- ond- feet.	Acre- feet.	Sec- ond- feet.	Acre- feet.
April			2,190	131,400	4,265	255,900	3,145	188,700	910	54,000
May	3,115	193,130	5,770	357,740	11,850	734,700	7,080	439,580	3,760	233,120
June	2,635	158,100	4,405	264,300	6,715	402,900	2,945	176,700	225	13,900
July	235	14,570	855	53,010	2,270	140,740	665	41,250	No record.	
August	Dry.	0	735	45,570	600	40,920	15	930	No record.	
September	Dry.	0	175	10,500	765	45,900	Dry (?)	0	No record.	
Total		*305,800		862,520		1,621,000		847,140		

* Five months.

Rating table by which the above is computed (†).

Feet.	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
5	115	140	170	210	260	320	390	470	560	690
6	770	890	1,040	1,240	1,500	1,785	2,070	2,355	2,640	2,925
7	3,210	3,495	3,780	4,065	4,350	4,635	4,920	5,205	5,490	5,775
8	6,060	6,345	6,630	6,915	7,200	7,485	7,770	8,055	8,340	8,625
9	8,910	9,195	9,480	9,765	10,050	10,335	10,620	10,910	11,200	11,490
10	11,780	12,070	12,360	12,650	12,950	13,250	13,550	13,850	14,150	14,450

Summary of use of water in San Luis Valley, Colorado.

District.	Prior to 1880.					1880.				
	Num- ber of ditches.	Capac- ity.	Decree.	Acres.	Acre- feet.	Num- ber of ditches.	Capac- ity.	Decree.	Acres.	Acre- feet.
20	162	844	628.83	22,935	91,740	182	979	751.55	26,205	104,820
21	42	328	501.08	12,900	51,600	51	382	684.07	15,100	60,400
22	45	420	1,147.07	22,800	91,200	50	456	1,215.88	24,100	96,400
23	19	300	255.50	8,500	34,000	20	307	259.50	8,650	34,000
24	108	1,587	601.76	33,050	132,200	121	1,689	682.10	34,100	136,400
25	117	1,002	390.62	15,650	46,950	130	1,000	416.32	16,680	50,000
26	42	156	39.15	3,285	13,140	49	173	47.42	4,000	16,000
27	36	120		2,640	10,560	36	120		2,640	10,560
Total	571	4,757	3,714.01	121,700	471,390	689	5,196	4,056.84	131,475	509,220
Increase						68	439	342.83	9,715	

District.	1881.					1882.				
	Num- ber of ditches.	Capac- ity.	Decree.	Acres.	Acre- feet.	Num- ber of ditches.	Capac- ity.	Decree.	Acres.	Acre- feet.
20	197	1,103	891.33	29,670	118,680	213	2,067	1,580.49	44,115	176,400
21	56	431	760.59	17,800	71,200	57	447	782.15	18,300	73,200
22	54	517	1,288.64	31,200	124,800	59	566	1,414.60	33,700	134,800
23	32	315	262.25	8,700	34,800	22	315	262.25	8,700	34,800
24	133	1,768	706.26	35,340	141,360	137	2,025	717.98	35,950	143,800
25	136	1,135	431.16	17,270	51,810	141	1,167	441.56	17,680	53,000
26	49	173	47.42	4,000	16,000	49	173	47.42	4,000	16,000
27	36	120		2,640	10,560	36	120		2,640	10,560
Total	683	5,562	4,387.65	146,620	569,210	714	6,870	5,246.45	165,085	642,000
Increase	44	366	330.81	15,145		31	1,308	858.80	18,465	

DISTRIBUTION OF WATERS OF THE RIO GRANDE.

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Summary of use of water in San Luis Valley, Colorado—Continued.

District.	1883.					1884.				
	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.
20.....	223	2,554	2,013.65	56,315	225,200	232	2,670	2,118.77	58,785	235,140
21.....	50	456	812.65	19,900	79,600	60	498	911.18	22,000	88,000
22.....	87	686	1,684.69	44,400	177,600	89	708	1,727.19	45,400	181,600
23.....	23	321	265.50	8,800	35,200	23	321	265.50	8,800	35,200
24.....	141	2,059	736.28	36,810	147,240	152	2,173	782.78	39,120	156,480
25.....	151	1,273	467.76	18,725	56,175	161	1,335	509.06	20,380	61,140
26.....	49	173	47.42	4,000	16,000	49	173	47.42	4,000	16,000
27.....	36	120	-----	2,640	10,560	37	122	-----	2,670	10,680
Total.....	769	7,642	6,027.95	191,500	747,635	803	8,000	6,361.90	201,155	784,240
Increase.....	55	772	781.50	26,505	-----	34	358	333.95	9,565	-----

District.	1885.					1886.				
	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.
20.....	238	2,797	2,230.36	61,935	247,740	246	3,083	2,597.25	66,045	264,180
21.....	63	551	1,019.50	24,000	96,000	66	612	1,163.53	29,300	102,550
22.....	92	780	1,801.69	51,700	206,800	95	854	2,110.19	56,400	225,600
23.....	23	321	265.50	8,800	35,200	23	321	265.50	8,800	35,200
24.....	156	2,188	789.78	39,450	157,800	159	2,218	800.08	39,900	159,720
25.....	162	1,344	515.86	20,655	61,965	168	1,380	530.56	21,220	65,680
26.....	49	173	47.42	4,000	16,000	49	173	47.42	4,000	16,000
27.....	37	122	-----	2,670	10,680	39	126	-----	2,890	11,560
Total.....	830	8,276	6,670.11	213,210	832,185	845	8,767	7,426.53	228,595	878,500
Increase.....	17	276	308.21	12,055	-----	25	491	756.42	15,385	-----

District.	1887.					1888.				
	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.
20.....	253	3,440	2,806.31	72,675	290,700	265	4,261	3,837.03	88,630	310,205
21.....	69	735	1,624.43	38,200	114,600	75	799	1,877.67	42,000	126,000
22.....	98	938	2,722.24	57,400	229,600	106	1,009	2,901.42	59,400	237,600
23.....	23	321	265.50	8,800	35,200	23	321	265.50	8,800	35,200
24.....	162	2,280	820.54	40,950	163,800	169	2,405	872.28	43,600	174,400
25.....	180	1,487	554.46	22,210	66,630	184	1,509	561.73	22,505	67,515
26.....	49	173	47.42	4,000	16,000	49	173	47.42	4,000	16,000
27.....	39	126	-----	2,890	11,560	41	326	-----	4,040	16,160
Total.....	873	9,500	8,930.90	247,125	928,000	912	10,803	10,363.08	272,975	983,080
Increase.....	28	733	1,504.37	18,530	-----	39	1,303	1,432.18	25,850	-----

District.	1889.					1890.				
	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.
20.....	266	4,085	4,359.83	97,535	341,370	266	5,465	5,050.31	112,480	337,440
21.....	75	799	1,877.67	42,000	126,000	75	799	1,877.67	44,000	88,000
22.....	107	1,034	2,974.42	60,000	240,000	107	1,034	2,974.42	60,000	180,000
23.....	23	321	265.50	8,800	35,200	25	356	265.50	10,000	40,000
24.....	171	2,456	919.18	45,950	183,800	171	2,456	919.18	45,950	137,850
25.....	184	1,509	561.76	22,505	67,515	184	1,509	561.76	22,505	67,515
26.....	49	173	47.42	4,000	16,000	49	173	47.42	4,000	12,000
27.....	35	47	-----	4,520	18,080	48	346	-----	4,780	14,340
Total.....	922	11,321	11,005.78	285,310	1,027,965	925	12,138	11,700.26	303,715	854,640
Increase.....	10	518	642.70	12,335	-----	3	817	694.48	18,465	-----

Summary of use of water in San Luis Valley, Colorado—Continued.

District.	1891.					1892.				
	Num- ber of ditches.	Capac- ity.	Decree.	Acres.	Acre- feet.	Num- ber of ditches.	Capac- ity.	Decree.	Acres.	Acre- feet.
20	266	5,572	5,137.81	166,480	499,440	266	6,034	5,561.76	216,685	455,925
21	75	799	1,877.67	46,000	92,000	75	799	1,877.67	45,000	90,000
22	107	1,034	2,978.42	55,000	165,000	107	1,034	2,978.42	50,000	150,000
23	25	356	265.50	10,000	35,000	25	356	265.50	10,000	35,000
24	171	2,490	919.18	46,750	140,250	171	2,501	919.18	47,550	142,650
25	184	1,509	561.76	21,430	42,890	184	1,509	561.76	20,290	40,580
26	49	173	47.42	4,000	12,000	49	173	47.42	4,000	12,000
27	48	346	.....	4,780	14,340	48	346	.....	4,780	14,340
Total ..	925	12,290	11,787.76	354,440	1,000,890	925	12,752	12,211.71	386,305	940,405
Increase ..	.....	131	87.50	50,725	.....	.....	483	423.95	45,865	.....

District.	1893.					1894.				
	Num- ber of ditches.	Capac- ity.	Decree.	Acres.	Acre- feet.	Num- ber of ditches.	Capac- ity.	Decree.	Acres.	Acre- feet.
20	266	6,034	5,561.76	179,785	382,125	266	6,034	5,561.76	166,085	297,315
21	75	799	1,877.67	44,000	88,000	75	799	1,877.67	42,000	84,000
22	107	1,034	2,978.42	45,000	135,000	107	1,034	2,978.42	50,000	125,000
23	25	356	265.50	10,000	30,000	25	356	265.50	10,000	30,000
24	171	2,501	919.18	46,290	138,690	171	2,501	919.18	44,750	111,875
25	184	1,509	561.76	19,160	38,320	184	1,509	561.76	18,020	37,040
26	49	173	47.42	4,000	12,000	49	173	47.42	4,000	10,000
27	48	346	.....	4,780	14,340	48	346	.....	4,780	11,900
Total ..	925	12,752	12,211.71	352,925	838,385	925	12,752	12,211.71	339,635	676,170
Increase ..	.....	.....	.....	-45,590	.....	.....	.....	.....	-13,290	.....

District.	1895.					1896.				
	Num- ber of ditches.	Capac- ity.	Decree.	Acres.	Acre- feet.	Num- ber of ditches.	Capac- ity.	Decree.	Acres.	Acre- feet.
20	266	6,034	5,561.76	164,795	394,815	266	6,034	5,561.76	139,795	257,270
21	75	799	1,877.67	41,550	109,050	75	799	1,877.67	37,940	96,335
22	107	1,034	2,978.42	55,000	165,000	107	1,034	2,978.42	60,625	98,285
23	25	356	265.50	9,500	38,000	25	356	265.50	7,050	25,980
24	171	2,501	919.18	42,940	161,975	171	2,501	919.18	46,295	118,100
25	184	1,509	561.76	16,850	50,550	184	1,509	561.76	20,205	16,170
26	49	173	47.42	4,040	16,160	49	173	47.42	2,670	6,740
27	48	346	.....	4,430	15,020	48	346	.....	4,180	10,410
Total ..	925	12,752	12,211.71	339,105	950,570	925	12,752	12,211.71	318,790	569,290
Change	-500	-20,345

DISTRIBUTION OF WATERS OF THE RIO GRANDE.

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Summary of use of water in Rio Grande drainage of New Mexico.

District.	Prior to 1880.				1880.				1881.			
	Number of ditches.	Capacity.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Acres.	Acre-feet.
1	11	32	1,270	5,080	11	32	1,270	5,080	11	32	1,270	5,080
2	108	933	24,750	84,800	108	933	24,750	84,800	108	933	24,750	84,800
3	17	161	8,360	25,430	17	161	8,360	25,430	17	161	8,360	25,430
4	60	334	17,750	45,250	60	334	17,750	45,250	60	334	17,750	45,250
5	31	220	8,160	24,220	31	220	8,160	24,220	31	220	8,160	24,220
6	43	156	5,800	13,750	43	156	5,800	13,750	43	156	5,800	13,750
7	44	117	5,920	10,590	44	117	5,920	10,590	44	117	5,920	10,590
8	23	60	2,240	4,350	23	60	2,240	4,350	23	60	2,240	4,350
9	21	119	5,410	19,300	21	119	5,410	19,300	21	119	5,410	19,300
10	52	422	16,410	33,330	61	440	16,980	35,040	61	440	16,980	35,040
11	26	85	2,550	4,270	26	85	2,550	4,270	26	85	2,550	4,270
12	31	400	14,160	44,580	31	400	14,160	44,580	31	400	14,160	44,580
13	32	311	8,070	32,280	32	311	8,070	32,280	32	311	8,070	32,280
14	32	1,138	17,840	71,360	32	1,138	17,840	71,360	32	1,138	17,840	71,360
15	16	300	5,790	23,160	16	300	5,790	23,160	16	300	5,790	23,160
16	8	162	6,150	24,600	8	162	6,150	24,600	8	162	6,150	24,600
17	9	650	28,700	114,800	9	650	28,700	114,800	9	650	28,700	114,800
Total	553	5,608	183,130	507,810	563	5,606	180,680	586,030	564	5,618	179,910	582,950
Change	.....	.....	.....	.....	+10	-2	-2,450	.....	+1	+12	-770	.....

District.	1882.				1883.				1884.			
	Number of ditches.	Capacity.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Acres.	Acre-feet.
1	11	32	1,270	5,080	11	32	1,270	5,080	11	32	1,270	5,080
2	108	933	24,750	84,800	108	933	24,750	84,800	108	933	24,750	84,800
3	17	161	8,360	25,430	17	161	8,360	25,430	17	161	8,360	25,430
4	60	334	17,750	45,250	60	334	17,750	45,250	60	334	17,750	45,250
5	31	220	8,160	24,220	31	220	8,160	24,220	31	220	8,160	24,220
6	43	156	5,800	13,750	43	156	5,800	13,750	43	156	5,800	13,750
7	44	117	5,920	10,590	44	117	5,920	10,590	44	117	5,920	10,590
8	23	60	2,240	4,350	23	60	2,240	4,350	23	60	2,240	4,350
9	23	123	5,510	19,690	23	123	5,510	19,690	23	123	5,510	19,690
10	61	440	16,980	35,040	61	440	16,980	35,040	61	440	16,980	35,040
11	26	85	2,550	4,270	26	85	2,550	4,270	26	85	2,550	4,270
12	31	400	14,160	44,580	31	400	14,160	44,580	31	400	14,160	44,580
13	32	311	8,070	32,280	32	311	8,070	32,280	32	311	8,070	32,280
14	32	1,138	17,840	71,360	32	1,138	17,840	71,360	32	1,138	17,840	71,360
15	16	300	5,790	23,160	16	300	5,790	23,160	16	300	5,790	23,160
16	8	162	6,150	24,600	8	162	6,150	24,600	11	179	6,490	25,960
17	9	650	28,700	114,800	9	650	28,700	113,200	9	650	27,900	111,600
Total	566	5,622	180,010	507,350	566	5,622	179,600	579,590	573	5,651	179,940	583,010
Change	+2	+4	+100	.....	.....	.....	-410	.....	+7	+29	+340	.....

Summary of use of water in Rio Grande drainage of New Mexico—Continued.

District.	1885.				1886.				1887.			
	Number of ditches.	Capacity.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Acres.	Acre-feet.
1	11	32	1,270	5,080	11	32	1,270	5,080	11	32	1,270	5,080
2	100	933	24,750	84,800	100	933	24,750	84,800	110	941	25,050	83,440
3	18	167	8,530	25,730	28	194	9,280	25,730	28	194	9,280	25,730
4	60	344	17,750	45,750	61	346	18,050	45,700	61	346	18,050	45,700
5	31	220	8,160	24,220	31	220	8,160	24,220	31	220	8,160	24,220
6	43	156	5,800	13,750	43	156	5,800	13,750	43	156	5,800	13,750
7	44	117	5,920	10,500	44	117	5,920	10,500	44	117	5,920	10,500
8	23	60	2,240	4,350	23	60	2,240	4,350	23	60	2,240	4,350
9	26	129	5,710	20,490	26	129	5,710	20,490	26	129	5,710	20,490
10	61	440	16,980	35,040	61	440	16,980	35,040	61	440	16,980	35,040
11	26	85	2,550	4,270	26	85	2,550	4,270	26	85	2,550	4,270
12	31	306	13,900	43,980	31	306	13,900	43,980	31	306	13,900	43,980
13	32	311	8,070	32,280	32	311	8,070	32,280	32	311	8,070	32,280
14	32	1,138	17,840	71,360	32	1,138	17,840	71,360	32	1,138	17,840	71,360
15	16	300	5,790	23,160	16	300	5,790	23,160	16	300	5,790	23,160
16	9	143	5,640	22,360	9	143	5,640	22,360	10	147	5,640	22,360
17	8	500	21,900	86,400	8	500	21,900	86,400	9	500	21,900	86,400
Total	570	5,321	173,040	555,610	581	5,500	173,000	553,960	584	5,602	174,010	550,360
Change	-3	-130	-6,900	.....	+11	+39	+620	.....	+3	+42	+350	.....

District.	1888.				1889.				1890.			
	Number of ditches.	Capacity.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Acres.	Acre-feet.
1	11	32	1,270	5,080	11	32	1,270	5,080	11	32	1,270	5,080
2	110	941	25,050	83,440	112	948	25,130	83,700	117	968	25,430	84,170
3	28	194	9,280	25,730	28	194	9,280	25,730	28	194	9,280	25,730
4	61	346	18,050	45,700	61	346	18,050	45,700	61	346	18,050	45,700
5	31	220	8,160	24,220	31	220	8,160	24,220	32	226	9,120	26,110
6	43	156	5,800	13,750	43	156	5,800	11,700	43	156	5,800	13,750
7	44	117	5,920	10,500	44	117	5,920	8,040	44	117	5,920	10,500
8	23	60	2,240	4,350	23	60	2,240	2,930	23	60	2,240	4,350
9	26	131	5,790	20,810	26	131	5,790	20,810	26	131	5,790	20,810
10	61	440	16,980	35,040	61	440	16,980	24,840	61	440	16,980	30,000
11	26	85	2,550	4,270	26	85	2,550	4,000	26	85	2,550	4,000
12	31	306	13,900	43,980	31	306	13,900	39,750	31	306	13,900	43,980
13	32	311	8,070	32,280	32	311	8,070	28,140	32	311	8,070	32,280
14	32	1,168	17,840	53,520	33	1,168	17,840	37,800	33	1,168	17,840	71,360
15	16	300	5,790	17,370	16	300	5,790	11,580	16	300	5,790	23,160
16	10	147	5,640	14,120	10	147	5,640	11,280	10	147	5,640	16,470
17	9	500	21,900	54,500	9	500	21,950	43,900	10	600	22,650	67,950
Total	586	5,634	174,190	488,750	588	5,641	174,420	421,630	595	5,687	176,220	526,600
Change	+2	+32	+180	+2	+7	+230	+7	+46	+1,800

DISTRIBUTION OF WATERS OF THE RIO GRANDE.

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Summary of use of water in Rio Grande drainage of New Mexico—Continued.

District.	1891.				1892.				1893.			
	Number of ditches.	Capacity.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Acres.	Acre-feet.
1.....	11	32	1,270	5,080	11	32	1,270	5,080	11	32	1,270	5,080
2.....	123	986	26,120	83,290	123	1,016	26,820	85,590	123	1,016	27,420	86,790
3.....	28	194	9,280	25,730	28	194	9,280	25,730	28	194	9,280	25,730
4.....	61	346	18,050	45,700	61	346	18,050	45,700	61	346	18,050	45,700
5.....	32	236	9,120	26,110	32	236	9,120	26,110	32	236	9,120	26,110
6.....	43	156	5,800	13,750	43	156	5,800	13,750	43	156	5,800	13,750
7.....	44	117	5,920	10,590	44	117	5,920	10,590	44	117	5,920	10,590
8.....	23	60	2,240	4,350	23	60	2,240	4,350	23	60	2,240	4,350
9.....	27	131	5,790	20,810	27	131	5,790	20,810	27	131	5,790	20,810
10.....	61	440	16,980	31,380	61	440	16,980	31,380	61	440	16,980	31,380
11.....	26	85	2,550	4,270	26	85	2,550	4,270	26	85	2,550	4,270
12.....	31	306	13,960	43,980	31	306	13,960	43,980	31	306	13,960	43,980
13.....	32	311	8,070	28,140	32	311	8,070	28,140	32	311	8,070	28,280
14.....	33	1,168	17,840	71,360	33	1,168	17,840	48,880	33	1,168	17,840	71,360
15.....	16	300	5,790	23,160	16	300	5,790	15,640	16	300	5,790	17,320
16.....	10	147	5,490	16,470	10	147	5,490	13,720	11	187	5,000	12,320
17.....	10	600	22,700	68,100	11	679	23,500	58,750	11	679	24,700	49,400
Total	598	5,705	176,970	522,270	602	5,814	178,470	482,470	604	5,864	180,490	501,160
Change	+3	+18	+750	.....	+4	+109	+1,500	.....	+2	+50	+2,020	.....

District.	1894.				1895.				1896.			
	Number of ditches.	Capacity.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Acres.	Acre-feet.
1.....	11	32	1,270	5,080	11	32	1,270	5,080	11	32	1,270	4,450
2.....	123	1,016	27,420	86,360	123	1,016	27,520	84,620	118	978	26,870	65,870
3.....	28	194	9,280	25,450	28	194	9,280	24,530	28	194	9,280	32,500
4.....	61	346	18,050	45,700	61	346	18,050	45,700	61	346	18,050	32,000
5.....	32	236	9,120	26,110	32	236	9,120	26,110	32	236	9,120	24,520
6.....	43	156	5,800	13,750	43	156	5,800	13,750	43	156	5,800	10,450
7.....	44	117	5,920	10,590	44	117	5,920	10,590	44	117	5,920	8,040
8.....	23	60	2,240	4,350	23	60	2,240	4,350	23	60	2,240	2,930
9.....	27	131	5,790	20,810	27	131	5,790	20,210	27	131	5,790	16,240
10.....	61	440	16,980	31,380	62	580	18,380	33,960	62	580	17,380	20,650
11.....	26	85	2,550	4,270	26	85	2,550	4,270	26	85	2,550	3,470
12.....	32	406	14,020	44,180	32	406	14,060	44,280	32	406	14,060	38,040
13.....	32	311	8,070	28,140	32	311	8,070	32,280	32	311	8,070	23,860
14.....	33	1,168	17,840	48,880	33	1,168	17,840	62,070	33	1,168	17,840	28,940
15.....	16	300	5,790	15,640	16	300	5,790	17,370	16	300	5,790	12,650
16.....	11	247	6,490	16,210	15	295	8,500	25,500	14	285	9,700	16,900
17.....	11	679	29,000	65,000	11	679	27,100	67,750	11	679	27,100	58,250
Total	604	5,924	182,630	491,940	609	6,112	187,280	522,460	603	6,064	186,830	389,820
Change .....	.....	+60	+2,140	.....	+5	+188	+4,650	.....	-6	-48	-450	.....

116 DISTRIBUTION OF WATERS OF THE RIO GRANDE.

Summary—District No. 20, Colorado.

Sheet.	Prior to 1880.					1880.				
	Number of ditches.	Capacity.	Decree.	Acres.	Acres-foot.	Number of ditches.	Capacity.	Decree.	Acres.	Acres-foot.
1.....	25	135	117.30	4,400	17,600	25	142	125.00	4,520	18,000
2.....	25	193	117.67	4,330	17,320	25	214	132.07	4,990	19,720
3.....	25	93	67.28	1,570	6,280	25	93	67.28	1,570	6,280
4.....	25	140	114.86	3,440	13,760	25	143	116.46	3,475	13,900
5.....	25	55	47.05	1,480	5,920	25	55	47.05	1,480	5,920
6.....	25	50	61.21	1,800	7,200	25	100	87.01	2,610	10,440
7.....	12	130	103.46	5,915	23,660	25	100	154.75	7,100	28,640
8.....	0					7	36	21.00	400	1,840
9.....										
10.....										
11.....										
Total..	162	844	628.83	22,935	91,740	182	979	751.55	26,205	104,820

Sheet.	1881.					1882.				
	Number of ditches.	Capacity.	Decree.	Acres.	Acres-foot.	Number of ditches.	Capacity.	Decree.	Acres.	Acres-foot.
1.....	25	143	125.83	4,540	18,160	25	145	129.03	4,630	18,520
2.....	25	244	156.27	5,650	22,600	25	250	162.57	5,820	23,280
3.....	25	16	72.54	1,650	6,600	25	95	72.54	1,650	6,600
4.....	25	144	117.66	3,550	14,200	25	144	117.66	3,550	14,200
5.....	25	55	47.05	1,480	5,920	25	60	53.05	1,670	6,680
6.....	25	111	91.01	2,750	11,000	25	111	91.01	2,750	11,000
7.....	25	218	182.35	8,120	32,480	25	232	194.55	9,320	37,280
8.....	22	161	98.62	1,930	7,720	25	835	653.18	12,000	48,000
9.....	0					13	185	100.50	2,725	10,900
10.....										
11.....										
Total..	197	1,103	891.33	29,670	118,680	213	2,067	1,580.49	44,115	176,400

Sheet.	1883.					1884.				
	Number of ditches.	Capacity.	Decree.	Acres.	Acres-foot.	Number of ditches.	Capacity.	Decree.	Acres.	Acres-foot.
1.....	25	153	139.83	4,930	19,720	25	153	139.83	4,930	19,720
2.....	25	253	164.17	5,880	23,520	25	253	164.17	5,880	23,520
3.....	25	112	88.98	2,065	8,020	25	112	88.98	2,065	8,020
4.....	25	144	118.26	3,565	14,260	25	144	118.26	3,565	14,260
5.....	25	60	53.05	1,670	6,680	25	60	53.05	1,670	6,680
6.....	25	114	93.51	2,840	11,360	25	117	95.91	2,920	11,680
7.....	25	232	194.55	9,320	37,280	25	230	200.15	9,750	39,000
8.....	25	835	653.18	19,000	76,000	25	840	661.38	19,300	77,200
9.....	25	650	507.12	7,105	28,420	25	710	558.62	7,495	29,980
10.....	0					7	31	32.42	1,270	5,080
11.....										
Total..	223	2,554	2,013.65	56,315	225,200	232	2,670	2,118.77	58,785	236,140

Sheet.	1885.					1886.				
	Number of ditches.	Capacity.	Decree.	Acres.	Acres-foot.	Number of ditches.	Capacity.	Decree.	Acres.	Acres-foot.
1.....	25	153	139.83	4,930	19,720	25	154	141.33	4,970	19,880
2.....	25	253	164.17	5,880	23,520	25	253	166.97	6,160	24,120
3.....	25	112	88.98	2,065	8,020	25	112	88.98	2,065	8,020
4.....	25	144	118.26	3,565	14,260	25	147	121.00	3,640	14,560
5.....	25	60	53.05	1,670	6,680	25	60	53.05	1,670	6,680
6.....	25	121	100.08	3,000	12,000	25	120	106.78	3,230	12,920
7.....	25	259	200.15	9,750	39,000	25	256	214.82	10,000	40,000
8.....	25	840	661.38	20,570	82,280	25	908	724.04	21,500	86,240
9.....	25	710	558.62	7,495	29,980	25	725	567.06	7,700	30,800
10.....	13	117	105.84	3,070	12,280	21	337	322.62	5,240	20,960
11.....						0				
Total..	238	2,797	2,230.36	61,935	247,740	246	3,083	2,507.25	66,045	264,180

DISTRIBUTION OF WATERS OF THE RIO GRANDE.

Summary—District No. 20, Colorado—Continued.

Sheet.	1887.					1888.				
	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.
1	25	154	141.33	4,970	19,880	25	154	141.33	4,970	17,395
2	25	255	166.97	6,030	24,120	25	255	166.97	6,030	21,105
3	25	112	88.98	2,005	8,020	25	112	88.98	2,005	7,015
4	25	147	121.00	3,640	14,560	25	147	121.00	3,640	12,740
5	25	60	53.05	1,700	6,080	25	62	53.85	1,700	5,950
6	25	132	109.58	3,320	13,320	25	140	110.00	3,520	12,320
7	25	261	218.68	10,300	40,800	25	274	220.00	10,540	36,890
8	25	948	752.94	22,060	90,640	25	1,000	790.54	24,125	84,440
9	25	779	645.86	8,630	34,520	25	1,229	957.26	15,750	55,125
10	25	578	546.72	8,780	35,120	25	583	553.12	9,010	31,535
11	3	14	90.00	700	3,040	15	305	615.40	7,340	25,000
Total	253	3,440	2,896.31	72,675	290,700	205	4,201	3,837.03	88,630	310,205

Sheet.	1889.					1890.				
	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.
1	25	154	141.33	4,970	17,395	25	154	141.33	4,970	14,910
2	25	255	166.97	6,030	21,105	25	255	166.97	6,030	18,000
3	25	112	88.98	2,005	6,015	25	112	88.98	2,005	6,015
4	25	147	121.00	3,640	12,740	25	147	121.00	3,640	10,920
5	25	62	53.85	1,700	5,950	25	62	53.85	1,700	5,100
6	25	148	123.69	3,700	13,160	25	155	129.39	3,900	11,880
7	25	278	232.99	10,620	37,170	25	288	239.40	10,840	32,520
8	25	1,080	849.44	26,100	91,350	25	1,155	924.54	29,000	87,000
9	25	1,380	1,134.16	17,100	59,850	25	1,906	1,622.04	26,825	80,475
10	25	583	553.12	9,010	31,535	25	695	667.82	10,910	32,730
11	16	476	893.70	12,600	44,100	16	476	893.70	12,600	37,800
Total	296	4,685	4,359.83	97,535	341,370	296	5,465	5,050.31	112,480	337,440

Sheet.	1891.					1892.				
	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.
1	25	154	141.33	4,970	14,910	25	154	141.33	4,970	14,910
2	25	255	166.97	6,030	18,000	25	255	166.97	6,030	18,000
3	25	112	88.98	2,005	6,015	25	112	88.98	2,005	6,015
4	25	147	121.00	3,640	10,920	25	151	126.20	3,800	11,400
5	25	62	53.85	1,700	5,100	25	66	56.15	1,755	5,205
6	25	155	129.39	3,900	11,880	25	156	130.59	3,905	11,985
7	25	298	249.49	10,840	32,520	25	288	245.74	10,840	21,680
8	25	1,230	976.54	31,000	93,000	25	1,681	1,270.24	42,880	85,960
9	25	1,998	1,658.14	56,325	168,975	25	2,000	1,774.04	76,500	153,000
10	25	695	667.82	12,910	38,730	25	685	667.82	15,410	30,820
11	16	476	893.70	53,100	99,300	16	476	893.70	48,400	96,800
Total	296	5,572	5,137.81	166,480	490,440	296	6,034	5,561.76	216,685	455,925

Sheet.	1893.					1894.				
	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.
1	25	154	141.33	4,970	14,910	25	154	141.33	4,970	14,910
2	25	255	166.97	6,030	18,000	25	255	166.97	6,030	18,000
3	25	112	88.98	2,005	6,015	25	112	88.98	2,005	6,015
4	25	151	126.20	3,800	11,400	25	151	126.20	3,800	11,400
5	25	66	56.15	1,755	5,205	25	66	56.15	1,755	5,205
6	25	156	130.59	3,905	11,985	25	156	130.59	3,905	11,985
7	25	288	245.74	10,840	21,680	25	288	245.74	10,840	17,345
8	25	1,681	1,270.24	42,880	85,960	25	1,681	1,270.24	42,880	68,770
9	25	2,000	1,774.04	43,100	86,200	25	2,000	1,774.04	31,600	50,500
10	25	685	667.82	14,410	28,820	25	685	667.82	13,410	21,455
11	16	476	893.70	45,900	91,800	16	476	893.70	44,700	71,520
Total	296	6,034	5,561.76	179,785	382,125	296	6,034	5,561.76	166,085	297,315

Summary—District No. 20, Colorado—Continued.

Sheet.	1805.					1806.				
	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.
1	25	154	141.33	4,970	14,910	25	154	141.33	4,475	13,000
2	25	255	166.97	6,030	18,000	25	255	166.97	5,130	17,380
3	25	112	88.98	2,005	6,015	25	112	88.98	1,825	4,655
4	25	151	126.20	3,800	11,400	25	151	126.20	3,350	8,705
5	25	66	56.15	1,755	5,265	25	66	56.15	1,545	3,265
6	25	156	130.59	3,905	11,985	25	156	130.59	3,330	11,835
7	25	288	245.74	10,940	25,160	25	288	245.74	9,370	27,730
8	25	1,681	1,270.24	42,980	98,855	25	1,681	1,270.24	36,545	64,750
9	25	2,000	1,774.04	31,600	72,680	25	2,000	1,774.04	24,790	50,545
10	25	665	667.82	13,170	30,290	25	665	667.82	12,400	29,315
11	16	476	893.70	43,550	100,165	16	476	893.70	37,035	25,840
Total	206	6,034	5,561.76	164,795	394,815	206	6,034	5,561.76	139,795	257,270

Estimate of areas watered under large canals.

Year.	Excelsior, No. 153.	Rio Grande, No. 198.	Monte Vista, No. 204.	Empire, No. 214.	San Luis Valley, No. 225.	Costilla, No. 237.	Farmers' Union, No. 254.	Kenelworth, No. 265.
	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
1800	3,000	30,340	8,845	7,450	7,500	1,050	34,755	550
1805	3,500	56,000	10,500	10,000	10,000	1,260	41,000	650
1804	3,500	36,000	10,500	10,000	10,000	1,500	42,000	800
1803	3,500	36,000	12,000	15,000	15,000	2,500	43,000	1,000
1802	3,500	36,000	15,000	40,000	20,000	3,500	45,000	1,500
1801	3,500	24,000	15,000	30,000	10,000	2,000	30,000	1,200
1800	3,500	22,000	9,825	10,000	5,000	1,000	20,000	1,000
1889	3,280	20,400	9,150	4,000	2,000	1,000	10,000	700
1888						5,000		

Summary—District No. 21, Colorado.

Sheet.	Prior to 1880.					1880.				
	No. of ditches.	Capacity.	Decree.	Acres.	Acre-feet.	No. of ditches.	Capacity.	Decree.	Acres.	Acre-feet.
1	25	160	294.12	6,000	24,000	25	160	294.12	6,000	24,000
2	17	168	296.96	6,000	27,600	25	217	382.75	9,000	36,000
3	9					1	5	7.20	100	400
Total	42	328	591.08	12,000	51,600	51	382	684.07	15,100	60,400
Sheet.	1881.					1882.				
	No. of ditches.	Capacity.	Decree.	Acres.	Acre-feet.	No. of ditches.	Capacity.	Decree.	Acres.	Acre-feet.
1	25	160	294.12	6,000	24,000	25	160	294.12	6,000	24,000
2	25	217	382.75	9,000	36,000	25	227	409.96	9,300	37,200
3	6	54	83.72	2,800	11,200	7	60	78.07	3,000	12,000
Total	56	431	760.59	17,800	71,200	57	447	782.15	18,300	73,200
Sheet.	1883.					1884.				
	No. of ditches.	Capacity.	Decree.	Acres.	Acre-feet.	No. of ditches.	Capacity.	Decree.	Acres.	Acre-feet.
1	25	160	294.12	6,000	24,000	25	160	294.12	6,000	24,000
2	25	227	409.96	9,300	37,200	25	247	486.26	10,000	40,000
3	9	69	108.57	4,600	18,400	10	91	130.80	6,000	24,000
Total	59	456	812.65	19,900	79,600	60	498	911.18	22,000	88,000

DISTRIBUTION OF WATERS OF THE RIO GRANDE.

121

Summary—District No. 21, Colorado—Continued.

Sheet.	1885.					1886.				
	No. of ditches.	Capacity.	Decree.	Acres.	Acre-feet.	No. of ditches.	Capacity.	Decree.	Acres.	Acre-feet.
1.....	25	160	294.12	6,000	24,000	25	160	294.12	6,000	21,000
2.....	25	247	486.26	10,000	40,000	25	247	486.26	10,000	35,000
3.....	13	144	239.12	8,000	32,000	16	205	385.15	13,300	46,550
Total	63	551	1,019.50	24,000	96,000	66	612	1,165.53	29,300	102,550

Sheet.	1887.					1888.				
	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.
1.....	25	160	366.75	6,700	20,100	25	160	366.75	6,700	20,100
2.....	25	284	690.16	12,300	36,900	25	284	690.16	12,300	36,900
3.....	19	291	567.52	19,200	57,600	25	355	820.76	23,000	69,000
Total	69	735	1,624.43	38,200	114,600	75	799	1,877.67	42,000	126,000

Sheet.	1889.					1890.				
	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.
1.....	25	160	366.75	6,700	20,100	25	160	366.75	7,000	14,000
2.....	25	284	690.16	12,300	36,900	25	284	690.16	12,300	36,900
3.....	25	355	820.76	23,000	69,000	25	355	820.76	24,200	48,400
Total	75	799	1,877.67	42,000	126,000	75	799	1,877.67	44,000	88,000

Sheet.	1891.					1892.				
	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.
1.....	25	160	366.75	7,400	14,800	25	160	366.75	7,200	14,400
2.....	25	284	690.16	13,400	25,800	25	284	690.16	13,100	18,450
3.....	25	355	820.76	25,300	50,400	25	355	820.76	24,700	49,400
Total	75	799	1,877.67	46,000	92,000	75	799	1,877.67	45,000	90,000

Sheet.	1893.					1894.				
	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.
1.....	25	160	366.75	7,000	14,000	25	160	366.75	6,700	10,050
2.....	25	284	690.16	12,080	25,600	25	284	690.16	11,080	7,265
3.....	25	355	820.76	24,200	48,400	25	355	820.76	23,000	34,500
Total	75	799	1,877.67	44,000	88,000	75	799	1,877.67	42,000	65,000

Sheet.	1895.					1896.				
	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.
1.....	25	160	366.75	6,655	20,230	25	160	366.75	6,655	10,595
2.....	25	284	690.16	12,080	36,550	25	284	690.16	11,080	7,265
3.....	25	355	820.76	22,815	52,270	25	355	820.76	20,805	8,475
Total	75	799	1,877.67	41,550	109,050	75	799	1,877.67	37,940	26,335

Summary—District No. 22, Colorado.

Sheet.	Prior to 1880.					1880.				
	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.
1	25	250	621.80	12,800	51,300	25	250	621.80	12,800	51,300
2	30	170	525.27	10,000	40,000	25	200	504.08	11,300	45,300
3						0				
4										
5										
Total..	45	420	1,147.07	22,800	91,300	50	456	1,215.88	24,100	96,400

Sheet.	1881.					1882.				
	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.
1	25	250	621.80	12,800	51,300	25	250	621.80	12,800	51,300
2	25	206	504.08	11,300	45,200	25	206	504.08	11,300	45,200
3	4	61	72.76	7,100	28,400	9	110	198.72	9,000	38,400
4						0				
5										
Total..	54	517	1,288.64	31,200	124,800	59	566	1,414.60	33,700	134,800

Sheet.	1883.					1884.				
	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.
1	25	252	625.80	13,000	52,000	25	252	625.80	13,000	52,000
2	25	206	504.08	11,300	45,200	25	207	504.08	11,400	45,600
3	25	170	351.81	14,000	56,000	25	170	353.81	14,000	56,000
4	12	58	113.00	6,100	24,400	14	59	149.50	7,000	28,000
5										
Total..	87	686	1,684.69	44,400	177,600	89	708	1,727.19	45,400	181,600

Sheet.	1885.					1886.				
	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.
1	25	252	625.80	13,000	52,000	25	252	625.80	13,000	52,000
2	25	212	604.08	11,600	46,400	25	212	604.08	11,600	46,400
3	25	170	353.81	14,000	56,000	25	217	514.56	15,700	62,800
4	17	146	216.00	13,100	52,400	20	173	365.75	16,100	64,400
5										
Total..	92	780	1,801.69	51,700	206,800	95	854	2,110.19	56,400	225,600

Sheet.	1887.					1888.				
	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.
1	25	254	620.80	13,200	52,800	25	254	633.80	13,300	53,200
2	25	212	604.08	11,600	46,400	25	219	615.12	11,900	47,000
3	25	217	514.56	15,700	62,800	25	233	587.40	16,000	64,000
4	23	255	973.80	16,900	67,000	25	238	1,017.10	17,500	70,000
5	0					6	35	48.00	700	2,800
Total..	98	958	2,722.24	57,400	229,000	106	1,000	2,901.42	59,400	237,000

DISTRIBUTION OF WATERS OF THE RIO GRANDE.

21001

Summary—District No. 22, Colorado—Continued.

Sheet.	1889.					1890.				
	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.
1.....	25	254	633.80	13,300	53,200	25	254	633.80	13,300	39,900
2.....	25	229	646.12	12,000	48,000	25	229	646.12	12,000	36,000
3.....	25	234	590.40	16,000	64,000	25	234	590.40	16,000	48,000
4.....	25	272	1,040.10	17,700	70,800	25	272	1,040.10	17,700	53,100
5.....	7	45	68.00	1,000	4,000	7	45	68.00	1,000	3,000
Total..	107	1,034	2,974.42	60,000	240,000	107	1,034	2,978.42	60,000	180,000

Sheet.	1891.					1892.				
	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.
1.....	25	254	633.80	12,500	37,500	25	254	633.80	11,200	33,600
2.....	25	229	646.12	11,000	33,000	25	229	646.12	10,000	30,000
3.....	25	234	590.40	15,000	45,000	25	234	590.40	13,500	40,500
4.....	25	272	1,040.10	15,600	46,800	25	272	1,040.10	14,500	43,500
5.....	7	45	68.00	900	2,700	7	45	68.00	800	2,400
Total..	107	1,034	2,978.42	55,000	165,000	107	1,034	2,978.42	50,000	150,000

Sheet.	1893.					1894.				
	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.
1.....	25	254	633.80	10,000	30,000	25	254	633.80	11,200	28,000
2.....	25	229	646.12	9,000	27,000	25	229	646.12	10,000	25,000
3.....	25	234	590.40	12,500	37,500	25	234	590.40	13,500	33,750
4.....	25	272	1,040.10	12,700	38,100	25	272	1,040.10	14,500	36,250
5.....	7	45	68.00	800	2,400	7	45	68.00	800	2,000
Total..	107	1,034	2,978.42	45,000	135,000	107	1,034	2,978.42	50,000	125,000

Sheet.	1895.					1896.				
	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.
1.....	25	254	633.80	12,500	37,500	25	254	633.80	13,455	30,600
2.....	25	229	646.12	11,000	33,000	25	229	646.12	11,965	21,815
3.....	25	234	590.40	15,000	45,000	25	234	590.40	16,250	18,880
4.....	25	272	1,040.10	15,000	46,800	25	272	1,040.10	17,890	19,220
5.....	7	45	68.00	900	2,700	7	45	68.00	1,035	1,710
Total..	107	1,034	2,978.42	55,000	165,000	107	1,034	2,978.42	60,625	98,285

Summary—District No. 25, Colorado.

Sheet.	Prior to 1880.					1880.				
	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.
1.....	25	446	152.30	7,000	30,400	25	446	152.30	7,000	30,400
2.....	25	556	336.38	16,800	67,200	25	598	339.38	17,000	68,000
3.....	25	360	104.41	5,200	20,800	25	364	106.41	5,300	21,200
4.....	25	170	55.61	2,800	11,200	25	170	55.61	2,800	11,200
5.....	8	55	13.06	650	2,600	21	141	28.40	1,400	5,600
6.....						0				
7.....										
Total..	108	1,587	661.76	33,050	132,200	121	1,689	682.10	34,100	136,400

Summary, District No. 25, Colorado—Continued.

Sheet	1881.					1882.				
	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.
1	25	446	152.30	7,600	30,400	25	646	159.50	8,000	32,000
2	25	568	339.38	17,000	68,000	25	568	339.38	17,000	68,000
3	25	364	106.41	5,300	21,200	25	364	106.41	5,300	21,200
4	25	178	57.61	2,900	11,600	25	185	60.01	3,000	12,000
5	25	167	40.80	2,050	8,200	25	167	40.80	2,050	8,200
6	8	45	9.76	490	1,900	12	95	11.88	600	2,400
7						0				
Total..	133	1,768	706.26	35,340	141,900	137	2,025	717.98	35,950	143,800

Sheet.	1883.					1884.				
	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.
1	25	658	165.30	8,290	33,040	25	658	172.50	8,600	34,400
2	25	580	346.88	17,350	69,400	25	603	358.88	17,950	71,800
3	25	364	106.41	5,300	21,200	25	385	112.71	5,630	22,520
4	25	185	60.01	3,000	12,000	25	190	62.81	3,140	12,560
5	25	167	40.80	2,050	8,200	25	171	41.80	2,100	8,400
6	16	105	16.88	850	3,400	25	156	27.28	1,350	5,400
7	0					2	10	6.80	350	1,400
Total..	141	2,069	736.28	36,810	147,240	152	2,173	782.78	39,120	156,480

Sheet.	1885.					1886.				
	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.
1	25	658	172.50	8,600	34,400	25	658	172.50	8,600	34,400
2	25	603	358.88	17,950	71,800	25	608	382.08	18,100	72,400
3	25	385	112.71	5,630	22,520	25	385	112.71	5,630	22,520
4	25	190	62.81	3,140	12,560	25	203	64.61	3,200	12,800
5	25	171	41.80	2,100	8,400	25	171	41.80	2,100	8,400
6	25	160	30.48	1,500	6,000	25	160	30.48	1,500	6,000
7	2	21	10.60	530	2,120	9	33	15.90	800	3,200
Total..	156	2,188	789.78	39,450	157,800	159	2,218	800.08	39,900	159,720

Sheet.	1887.					1888.				
	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.
1	25	658	172.50	8,600	34,400	25	686	191.50	9,600	38,400
2	25	628	375.94	18,800	75,200	25	648	392.94	19,650	78,600
3	25	390	114.21	5,700	22,800	25	434	117.01	5,850	23,400
4	25	203	64.61	3,200	12,800	25	203	64.61	3,200	12,800
5	25	171	41.80	2,100	8,400	25	171	41.80	2,100	8,400
6	25	160	30.48	1,500	6,000	25	169	33.98	1,700	6,800
7	12	70	21.00	1,050	4,200	19	94	30.44	1,500	6,000
Total..	162	2,280	820.54	40,950	163,800	169	2,405	872.28	43,600	174,400

Sheet.	1889.					1890.				
	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.
1	25	686	191.50	9,600	38,400	25	686	191.50	9,600	38,400
2	25	602	436.74	21,800	87,200	25	602	436.74	21,800	87,200
3	25	434	117.01	5,850	23,400	25	434	117.01	5,850	23,400
4	25	203	64.61	3,200	12,800	25	203	64.61	3,200	12,800
5	25	171	41.80	2,100	8,400	25	171	41.80	2,100	8,400
6	25	169	33.98	1,700	6,800	25	169	33.98	1,700	6,800
7	21	101	33.54	1,700	6,800	21	101	33.54	1,700	6,800
Total..	171	2,456	919.18	45,950	183,800	171	2,456	919.18	45,950	183,800

DISTRIBUTION OF WATERS OF THE RIO GRANDE.

125

Summary—District No. 25, Colorado—Continued.

Sheet.	1891.					1892.				
	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.
1.....	25	686	191.50	9,600	28,800	25	686	191.50	9,600	28,800
2.....	25	682	436.74	21,800	65,400	25	682	436.74	21,800	65,400
3.....	25	434	117.01	5,850	17,550	25	434	117.01	5,850	17,550
4.....	25	203	64.61	3,200	9,600	25	203	64.61	3,200	9,600
5.....	25	171	41.80	2,100	6,300	25	171	41.80	2,100	6,300
6.....	25	169	33.98	1,700	5,100	25	169	33.98	1,700	5,100
7.....	21	146	33.54	2,500	7,500	21	146	33.54	3,300	9,900
Total..	171	2,480	919.18	46,750	140,250	171	2,501	919.18	47,550	142,650

Sheet.	1893.					1894.				
	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.
1.....	25	686	191.50	9,300	27,900	25	686	191.50	9,000	22,500
2.....	25	682	436.74	21,200	63,600	25	682	436.74	20,500	51,250
3.....	25	434	117.01	5,700	17,100	25	434	117.01	5,500	13,750
4.....	25	203	64.61	3,100	9,300	25	203	64.61	3,050	7,625
5.....	25	171	41.80	2,050	6,150	25	171	41.80	2,000	5,000
6.....	25	169	33.98	1,650	4,950	25	169	33.98	1,600	4,000
7.....	21	146	33.54	3,200	9,600	21	146	33.54	3,100	7,750
Total..	171	2,501	919.18	46,200	138,000	171	2,501	919.18	44,750	111,875

Sheet.	1895.					1896.				
	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.
1.....	25	686	191.50	9,135	26,195	25	686	191.50	9,375	24,245
2.....	25	682	436.74	19,350	56,755	25	682	436.74	21,905	55,065
3.....	25	434	117.01	5,290	20,965	25	434	117.01	5,790	14,650
4.....	25	203	64.61	2,810	9,930	25	203	64.61	3,125	8,110
5.....	25	171	41.80	1,910	7,000	25	171	41.80	1,910	4,980
6.....	25	169	33.98	1,520	4,325	25	169	33.98	1,585	4,370
7.....	21	146	33.54	2,925	6,745	21	146	33.54	3,205	6,650
Total..	171	2,501	919.18	42,940	161,975	171	2,501	919.18	46,295	118,100

Summary—District No. 26, Colorado.

Sheet.	Prior to 1880.					1883.				
	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.
1.....	25	237	108.18	4,300	12,900	25	237	108.18	4,300	12,900
2.....	25	171	94.12	3,800	11,400	25	171	94.12	3,800	11,400
3.....	25	200	101.00	4,050	12,150	25	200	101.00	4,050	12,150
4.....	25	211	54.92	2,200	6,600	25	211	54.92	2,200	6,600
5.....	17	93	32.40	1,300	3,900	25	131	41.96	1,680	5,040
6.....	0					5	50	16.20	650	1,950
7.....										
8.....										
Total..	117	1,002	390.62	15,650	46,850	130	1,080	416.32	16,680	50,040

Summary—District No. 26, Colorado—Continued.

Sheet.	1881.					1882.				
	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.
1	25	237	108.18	4,300	12,900	25	237	108.18	4,300	12,900
2	25	171	94.12	3,800	11,400	25	171	94.12	3,800	11,400
3	25	310	108.80	4,300	13,080	25	310	108.80	4,300	13,080
4	25	211	54.92	2,200	6,600	25	211	54.92	2,200	6,600
5	25	134	44.30	1,770	5,310	25	134	44.30	1,770	5,310
6	11	83	20.24	1,050	3,150	16	104	31.24	1,250	3,750
7						0				
8										
Total..	136	1,135	431.16	17,270	51,810	141	1,167	441.56	17,680	53,040

Sheet.	1883.					1884.				
	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.
1	25	237	108.18	4,300	12,900	25	237	108.18	4,300	12,900
2	25	171	94.12	3,800	11,400	25	171	94.12	3,800	11,400
3	25	310	108.80	4,300	13,080	25	310	108.80	4,300	13,080
4	25	211	54.92	2,200	6,600	25	211	54.92	2,200	6,600
5	25	134	44.30	1,770	5,310	25	134	44.30	1,770	5,310
6	25	208	55.84	2,230	6,690	25	219	57.24	2,290	6,870
7										
8	1	2	1.00	65	195	11	53	41.50	1,600	4,950
Total..	151	1,273	467.76	18,725	56,175	161	1,335	500.06	20,380	61,140

Sheet.	1885.					1886.				
	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.
1	25	237	108.18	4,300	12,900	25	237	108.18	4,300	12,900
2	25	171	94.12	3,800	11,400	25	171	94.12	3,800	11,400
3	25	310	108.80	4,300	13,080	25	324	113.80	4,500	13,600
4	25	211	54.92	2,200	6,600	25	211	54.92	2,200	6,600
5	25	134	44.30	1,770	5,310	25	134	44.30	1,770	5,310
6	25	226	62.44	2,500	7,500	25	226	62.44	2,500	7,500
7	12	53	43.10	1,725	5,175	18	77	52.80	2,100	6,300
8						0				
Total..	162	1,344	515.86	20,655	61,965	168	1,380	530.56	21,270	63,690

Sheet.	1887.					1888.				
	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.
1	25	237	108.18	4,300	12,900	25	237	108.18	4,300	12,900
2	25	171	94.12	3,800	11,400	25	171	94.12	3,800	11,400
3	25	324	113.80	4,500	13,680	25	324	113.80	4,500	13,680
4	25	211	54.92	2,200	6,600	25	211	54.92	2,200	6,600
5	25	134	44.30	1,770	5,310	25	134	44.30	1,770	5,310
6	25	226	62.44	2,500	7,500	25	226	62.44	2,500	7,500
7	25	159	68.40	2,750	8,250	25	159	68.40	2,750	8,250
8	5	25	8.30	330	990	9	47	15.00	625	1,875
Total..	180	1,487	554.46	22,210	66,630	184	1,509	561.76	22,505	67,515

DISTRIBUTION OF WATERS OF THE RIO GRANDE.

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Summary—District No. 26, Colorado—Continued.

Sheet.	1880.					1890.				
	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.
1	25	237	108.18	4,300	12,900	25	237	108.18	4,300	8,600
2	25	171	94.12	3,800	11,400	25	171	94.12	3,800	7,600
3	25	324	113.80	4,500	13,680	25	324	113.80	4,500	9,120
4	25	211	54.92	2,200	6,600	25	211	54.92	2,200	4,400
5	25	134	44.30	1,770	5,310	25	134	44.30	1,770	3,540
6	25	226	62.44	2,500	7,500	25	226	62.44	2,500	5,000
7	25	159	68.40	2,750	8,250	25	159	68.40	2,750	5,500
8	9	47	15.60	625	1,875	9	47	15.60	625	1,250
Total.	184	1,509	561.76	22,505	67,515	184	1,509	561.76	22,505	45,010

Sheet.	1891.					1892.				
	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.
1	25	237	108.18	4,100	8,200	25	237	108.18	3,900	7,800
2	25	171	94.12	3,600	7,200	25	171	94.12	3,400	6,800
3	25	324	113.80	4,340	8,680	25	324	113.80	4,110	8,220
4	25	211	54.92	2,060	4,180	25	211	54.92	1,980	3,960
5	25	134	44.30	1,680	3,360	25	134	44.30	1,590	3,180
6	25	226	62.44	2,370	4,740	25	226	62.44	2,250	4,500
7	25	159	68.40	2,650	5,300	25	159	68.40	2,500	5,000
8	9	47	15.60	600	1,200	9	47	15.60	500	1,120
Total.	184	1,509	561.76	21,430	42,860	184	1,509	561.76	20,290	40,580

Sheet.	1893.					1894.				
	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.
1	25	237	108.18	3,700	7,400	25	237	108.18	3,500	5,250
2	25	171	94.12	3,200	6,400	25	171	94.12	3,000	4,500
3	25	324	113.80	3,880	7,760	25	324	113.80	3,650	5,475
4	25	211	54.92	1,870	3,740	25	211	54.92	1,700	2,550
5	25	134	44.30	1,500	3,000	25	134	44.30	1,410	2,115
6	25	226	62.44	2,130	4,260	25	226	62.44	2,040	3,060
7	25	159	68.40	2,350	4,700	25	159	68.40	2,200	3,300
8	9	47	15.60	530	1,060	9	47	15.60	500	750
Total.	184	1,509	561.76	19,160	38,320	184	1,509	561.76	18,020	27,030

Sheet.	1895.					1896.				
	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.	Number of ditches.	Capacity.	Decree.	Acres.	Acre-feet.
1	25	237	108.18	3,240	9,720	25	237	108.18	3,880	3,105
2	25	171	94.12	2,820	8,460	25	171	94.12	3,380	2,705
3	25	324	113.80	3,420	10,260	25	324	113.80	4,100	3,280
4	25	211	54.92	1,650	4,950	25	211	54.92	1,980	1,585
5	25	134	44.30	1,330	3,990	25	134	44.30	1,600	1,280
6	25	226	62.44	1,870	5,610	25	226	62.44	2,245	1,795
7	25	159	68.40	2,050	6,150	25	159	68.40	2,460	1,970
8	9	47	15.60	470	1,410	9	47	15.60	500	450
Total.	184	1,509	561.76	16,850	50,550	184	1,509	561.76	20,265	16,170

DISTRIBUTION OF WATERS OF THE RIO GRANDE.

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List of ditches in District No. 20, Colorado.

No.	Name.	Stream.	Date of first use.	Decree.	Possible acreage.	Capacity.	1885.		1896.			Remarks.
							Days.	Per day.	Acres.	Days.	Per acre.	
1	Sylvia.....	Rio Grande.....	1896, 1870, 1874, 1883.	19.00	1,000	25	150	10	600	150	20	1896, 2; 1870, 11; 1874, 2.40; 1883, 2.30.
2	Atencio.....	do.....	1896, 1874, 1874, 1876, 1882.	14.54	1,000	8	.....	.....	440	100	4	1896, 0.74; 1873, 5.30; 1874, 1.00; 1876, 3.80; 1882, 3.20.
3	San Jose or Lucero.	do.....	1896, 1882.....	9.50	500	7	.....	.....	335	100	4	1896, 0.90; 1883, 8.00; 1877, 3.80; 1879, 2.40; 1881, 0.80.
4	Montoya No. 1.....	Pinos Creek.....	1897, 1870, 1881.....	7.00	350	7	.....	.....	100	.....	.....	.....
5	Montoya No. 3.....	do.....	1870.....	.90	45	1	.....	.....	30	.....	.....	.....
6	Montoya No. 4.....	do.....	1870.....	1.00	50	1	.....	.....	35	.....	.....	.....
7	Rio Grande No. 1.....	Rio Grande.....	1871.....	12.80	1,000	18	.....	.....	560	150	5	.....
8	Mexican.....	Pinos Creek.....	1871, 1874, 1886.	3.70	185	4	.....	.....	105	.....	.....	.....
9	James McLeary.....	San Francisco Creek.....	1872.....	2.00	100	4	.....	.....	70	.....	.....	.....
10	McDonald.....	Rio Grande.....	1872, 1873.....	22.40	1,400	20	.....	.....	825	60	12	1871, 1.70; 1874, 0.50; 1886, 1.50.
11	College.....	San Francisco Creek.....	1872.....	1.50	75	2	.....	.....	45	.....	.....	.....
12	Contrahe Pioneer.....	Rio Grande.....	1873, 1874, 1876, 1880.....	2.50	800	10	.....	.....	600	100	4	.....
13	Homer.....	do.....	1873, 1874, 1876, 1880.....	22.35	500	12	.....	.....	385	130	6	1873, 2.30; 1874, 4.40; 1876, 8.30; 1880, 1.53.
14	Dyer.....	do.....	1873, 1874, 1876, 1880.....	1.00	50	2	.....	.....	35	.....	.....	.....
15	San Francisco Over-flow.	San Francisco Creek.....	1873, 1874, 1876, 1880.....	1.00	80	2	.....	.....	35	.....	.....	.....
16	Valdez No. 2.....	do.....	1873, 1874, 1876, 1880.....	1.20	60	2	.....	.....	40	.....	.....	.....
17	Pace.....	Rio Grande.....	1873, 1874, 1876, 1880.....	1.40	500	5	.....	.....	200	100	2.5	.....
18	Martinez.....	San Francisco Creek.....	1873, 1874, 1876, 1880.....	2.40	120	4	.....	.....	80	.....	.....	.....
19	Valdez No. 1.....	do.....	1873, 1874, 1876, 1880.....	3.10	105	4	.....	.....	110	.....	.....	.....
20	Robran.....	Pinos Creek.....	1873, 1874, 1876, 1880.....	4.60	220	9	.....	.....	130	.....	.....	.....
21	Jemison No. 6.....	do.....	1873, 1874, 1876, 1880.....	.70	35	1	.....	.....	25	.....	.....	.....
22	Jemison No. 4.....	do.....	1873, 1874, 1876, 1880.....	1.00	50	1	.....	.....	30	.....	.....	.....
23	Beran No. 6.....	do.....	1873, 1874, 1876, 1880.....	.66	35	1	.....	.....	25	.....	.....	.....
24	Lavallo.....	San Francisco Creek.....	1874.....	1.00	50	2	.....	.....	35	.....	.....	.....
25	Schneider, No. 1.....	Schneider Creek.....	1874.....	1.20	80	2	.....	.....	55	.....	.....	.....
26	Jemison & Beran No. 2.....	Pinos Creek.....	1874.....	2.20	110	3	.....	.....	55	.....	.....	.....

List of ditches in District No. 20, Colorado—Continued.

No.	Name.	Stream.	Date of first use.	Decree.	Possible acreage.	Capacity.	1885.			1890.			Remarks.
							Days.	Per day.	Acres.	Days.	Per day.	Acres.	
27	Loma	Rio Grande	1874, 1881	8.00	400	8			220			800	1874, 2; 1881, 6.
28	Pinos Creek No. 1.	Pinos Creek	1874	13.40	670	20			360			325	
29	Hubbard No. 2.	Rio Grande	1874	1.00	50	2			45			120	
30	Hubbard.	do	1874	1.60	200	2			200	160	3	720	1874, 35.80; 1875, 4.10;
31	Centennial.	do	1874, 1875, 1876, 1879, 1880, 1881, 1882, 1883.	82.97	3,000	152	180	75	3,000	130	45	9,000	1876, 7.00; 1879, 19.35; 1880, 10.40; 1881, 2.00; 1882, 1.50; 1883, 1.00.
32	Schroder No. 2	Schroder Creek	1874	1.60	80	3			55			150	1874, 3; 1881, 15.00.
33	Fish	Rio Grande	1874, 1881	18.60	2,000	25			590	130	6	1,800	
34	Alder Creek No. 1.	Alder Creek	1874	2.00	150	3			150			510	
35	Kane & Collan.	Rio Grande.	1874, 1880, 1886.	8.20	1,000	6			510	150	4	1,200	1874, 1.00; 1880, 4; 1886, 2.60.
36	Larick No. 5	Rock Creek	1874	2.60	130	3			100			65	80
37	Butler Irrigating	Rio Grande	1874, 1882	8.80	500	6			220	135	5	800	1874, 4; 1882, 4.50.
38	Rienan No. 2	San Francisco Creek	1874	1.00	50	2			35			60	30
39	Rienan No. 1	do	1874	1.00	50	1			35			60	30
40	Jemison No. 9	Pinos Creek	1874	.70	35	1			15			30	15
41	Alder Creek No. 2	do	1874	2.00	150	3			150			510	140
42	Jemison No. 7	Pinos Creek	1874	.80	40	1			25			40	20
43	Burns, Larsen & Kiel	San Francisco Creek	1874	1.00	50	1			35			60	30
44	Jemison No. 5	Pinos Creek	1874	.54	25	1			10			20	10
45	Jemison No. 8	do	1874	.74	35	2			20			30	15
46	Larick No. 4	Rock Creek	1874	2.60	130	3			75			80	65
47	Dupke No. 2	do	1874	1.30	60	2			40			45	35
48	Dupke No. 3	do	1874	1.24	60	2			35			40	30
49	Dupke No. 4	do	1874	2.48	100	2			20			20	25
50	Dupke No. 6	do	1874	3.00	30	1			40			60	50
51	Dupke No. 5	Rock Creek	1874	3.08	100	2			65			120	60
52	Burns	San Francisco Creek.	1874	2.10	100	2			65			120	60
53	Anderson	Rio Grande	1874, 1875, 1876	21.10	800	30	150	9	300	150	9	1,200	1874, 3.20; 1875, 8.30; 1876, 9.00.
54	Grubb No. 2	Bear Creek	1874	1.00	60	2			45			240	40
55	Shaw No. 2	Spring Creek	1874	1.20	60	2			40			160	40
56	Grader No. 1	Rock Creek	1874	1.80	90	3			35			180	30
57	Grader No. 2	Rock Creek	1874	1.82	90	3			50			55	45
58	Elliot No. 1	Pinos Creek	1875	1.50	75	3			40			70	35
59	Elliot No. 4	do	1875	2.00	100	3			50			90	45
60	Elliot No. 3	do	1875	1.00	50	2			30			50	25
61	Elliot No. 2	do	1875	1.00	50	2			30			50	25
62	Jemison No. 2	do	1875	1.80	40	1			25			40	20
63	Jemison No. 2	do	1875	1.80	40	1			25			40	20

DISTRIBUTION OF WATERS OF THE RIO GRANDE. 131

64	Meadows Overflow	Rio Grande	1875, 1883	4.00	100	5	100	40	2	100	100	1875, 3.30; 1883, 0.80.
65	Poole's Brook	Pinos Creek	1875	1.00	50	2	25	.....	.....	40	20	.....
66	McDonald's	do	1875	1.00	50	2	25	.....	.....	40	20	.....
67	Lozano, Davis & Bin- gle.	Rio Grande	1875, 1881	10.34	500	6	250	.....	.....	300	180	1875, 6.08; 1881, 4.28.
68	Ewing, No. 2	Embargo Creek	1875	1.40	60	4	30	.....	.....	120	25	.....
69	Raber	Rio Grande	1875	2.80	140	5	85	.....	.....	240	80	.....
70	San Luis Valley Irriga- tion.	do	1875, 1883	25.00	1,000	25	530	.....	.....	900	480	1875, 8.40; 1883, 15.00.
71	Chadwick, No. 1	Willow Creek	1875	2.00	100	2	65	.....	.....	180	60	.....
72	Poole Fairchild	Pinos Creek	1875	1.80	100	2	65	.....	.....	180	60	.....
73	Harker, No. 2	Rock Creek	1875	2.00	100	2	65	.....	.....	180	60	.....
74	Smith, No. 1	do	1875	52	20	1	20	.....	.....	20	15	.....
75	Jarvis, No. 1	Pinos Creek	1875	74	35	1	20	.....	.....	20	15	.....
76	Ewing No. 3	Embargo Creek	1875	2.00	90	3	50	.....	.....	180	45	.....
77	Off	Rio Grande	1875	8.40	520	10	495	100	7	1,800	450	1875, 16.67; 1876, 16.66;
78	Rough and Ready	Rock Creek	1875, 1876, 1886	34.37	1,500	21	900	.....	.....	725	765	1886, 1.04; 1887, 1.20;
79	McIntosh Arroyo	Rio Grande	1875, 1881, 1892	6.40	500	6	375	140	3	840	340	1875, 3.80; 1881, 1.20;
80	McDonald & Gleason	Rock Creek	1875	10.25	400	10	240	.....	.....	220	200	1892, 1.40.
81	Larick No. 7	do	1875	1.00	50	1	25	.....	.....	25	20	.....
82	Jarvis	Pinos Creek	1875, 1882	8.00	400	10	210	.....	.....	300	100	1875, 6; 1892, 2.
83	Larick No. 8	Rock Creek	1875	.68	30	1	25	.....	.....	20	15	.....
84	Larick No. 6	do	1875	.76	35	1	25	.....	.....	20	15	.....
85	Smith No. 3	do	1875	1.00	50	1	25	.....	.....	25	20	.....
86	Cadle No. 1	do	1875	1.50	75	5	40	.....	.....	40	35	.....
87	Hanna No. 1	Pinos Creek	1875	.70	35	1	20	.....	.....	30	15	.....
88	Beran No. 2	do	1875	.70	35	1	15	.....	.....	30	15	.....
89	Ewing No. 1	Embargo Creek	1875	.80	30	1	20	.....	.....	60	15	.....
90	Hanna No. 2	Pinos Creek	1875	1.00	50	1	25	.....	.....	40	20	1875, 1; 1883, 0.01; 1892,
91	Little Anna	do	1875, 1883, 1892	2.80	110	3	70	.....	.....	130	65	1.20.
92	Beran No. 3	do	1875	1.00	50	2	35	.....	.....	40	20	.....
93	Poole Brush	do	1875	.80	45	1	25	.....	.....	40	20	.....
94	Poole Bochie	do	1875	.35	35	1	15	.....	.....	30	15	.....
95	O'Connell	do	1876, 1886	1.70	85	2	45	.....	.....	80	40	1876, 1; 1886, 0.70.
96	Chadwick No. 3	Willow Creek	1876	7.0	70	3	35	.....	.....	30	30	.....
97	Embargo	Embargo Creek	1876, 1880, 1886	6.70	250	12	145	.....	.....	520	130	1876, 3.50; 1880, 1.00;
98	Elliott & Beran	Pinos Creek	1876	1.00	50	2	25	.....	.....	40	20	1880, 1.00.
99	Independent No. 2	Rio Grande	1876, 1879	20.00	1,200	50	880	100	10	3,200	800	1876, 25.00; 1879, 4.80.
100	Highway	do	1876	2.00	100	2	55	.....	.....	100	50	.....
101	Bishop & Larick	Rock Creek	1876	2.00	120	2	70	.....	.....	50	40	.....
102	Bishop No. 5	Pinos Creek	1876	1.20	60	2	30	.....	.....	40	25	.....
103	Fairchild No. 2	do	1876	.45	45	1	25	.....	.....	30	20	.....
104	Barkley	do	1876	1.50	75	2	35	.....	.....	55	35	.....
105	Bennett No. 1	do	1876	1.20	60	1	30	.....	.....	40	25	.....
106	Bennett Creek	Bennett Creek	1876	1.20	50	1	30	.....	.....	45	25	.....
107	Norris	Pinos Creek	1876	.90	45	1	25	.....	.....	30	20	.....
108	Beran No. 4	do	1876	.80	40	1	25	.....	.....	30	20	1876, 1; 1882, 6.
109	San Francisco	San Francisco Creek	1876, 1882	7.00	350	6	220	.....	.....	400	200	.....

List of ditches in District No. 20, Colorado—Continued.

No.	Name.	Stream.	Date of first use.	Decrease acreage.	Capacity.	1895.		1896.		Remarks.
						Days.	Per day.	Days.	Per day.	
110	Bennett No. 2	Pinos Creek	1876	1.00	50			25		
111	Tryon	Rock Creek	1876	6.25	300			150		20
112	Fairchild No. 1	Pinos Creek	1876	1.00	50			145		125
113	Little Danube	do	1876, 1888, 1892	5.60	250					20
										130
114	Kiel & Larsen	San Francisco Creek	1876	1.00	50			35		30
115	Phillips No. 1	Elk Creek	1876	1.20	60			105		35
116	Chadwick No. 2	Willow Creek	1876	1.00	50			35		30
117	Chadwick No. 3	do	1876	2.00	100			165		35
118	Todd	Cherry Creek	1876	.90	45			35		30
119	Phillips No. 2	Elk Creek	1876	1.00	50			35		30
120	Town of Del Norte	Rio Grande	1876	9.20	400			400		300
121	Ward No. 1	San Francisco Creek	1877	1.00	50			1.00		45
122	Ward No. 3	do	1877	1.00	50			50		30
123	Cochran Bros. No. 1	do	1877	2.30	115			35		60
124	Cochran Bros. No. 2	do	1877	3.00	150			100		65
125	Boehle	Pinos Creek	1877	1.00	50			35		90
126	Wolf Creek, No. 1	Wolf Creek	1877	.86	45			25		30
127	Wolf Creek, No. 2	do	1877	4.00	200			95		85
128	Smith, No. 1	do	1877	4.00	250			340		30
129	Smith, No. 2	Rock Creek	1877	1.82	100			40		35
130	Ewing, No. 4	Embargo Creek	1877	2.00	80			45		40
131	James Peterson	Rio Grande	1877, 1892	4.80	200			150	2	100
132	Smith, No. 1	Rock Creek	1877	5.00	50			25		20
133	Jenison & Beran	Pinos Creek	1877	1.00	50			25		20
134	Jenison, No. 1	do	1877	.50	45			15		15
135	Alencio, No. 3	Rio Grande	1877	4.00	200			175		160
136	Mill	Rock Creek	1877	2.00	120			60		50
137	Rio Grande and Piedra Valley.	Rio Grande	1877, 1880, 1881, 1883, 1884, 1886, 1887, 1888, 1889, 1890.	76.45	5,000	131	75	2,000	45	2,100
138	MacLeod, No. 5	San Francisco Creek	1878	1.00	50			30		25
139	Shaw, No. 1	Spring Creek	1878	4.00	200			140		140
140	Shaw, No. 3	do	1878	1.20	60			40		40
141	MacLeod, No. 1	San Francisco Creek	1878	1.00	50			50		25
142	Larick, No. 9	Rock Creek	1878	.80	40			30		15
143	Hellman & Larick	do	1878	1.00	50			20		15
144	Compos	Willow Creek	1878	.80	40			20		20
145	Larick, No. 2	Rock Creek	1878, 1885, 1888	9.33	400			170		140
146	Mollet	Pinos Creek	1878	2.00	100			45		55

1876, 2.50; 1888, 0.80; 1892, 2.30.

1877, 3.00; 1892, 1.20.

1877, 16.00; 1880, 25.80; 1881, 4.00; 1883, 2.50; 1884, 2.40; 1886, 6.70; 1887, 2.80; 1888, 3.25; 1889, 6.70; 1890, 5.70.

1878, 1.00; 1895, 4.17; 1898, 4.16.

[illegible]

List of ditches in District No. 20, Colorado—Continued.

No.	Name.	Stream.	Date of first use.	Decree.	Possible acreage.	Capacity.	1885.			1896.			Remarks.
							Days.	Per day.	Acres.	Per day.	Per day.	Acres.	
185	Mike White	Rio Grande	1881	13.20									Included in totals of Rio Grande Canal.
186	Rio Grande No. 2	do	1881	3.20	500	5						210	
187	Bachman No. 2	Embargo Creek	1881	3.20	130	3						280	
188	Rio Grande and San Luis.	Rio Grande	1881	21.00	1,000	25						1,280	
189	Darbes No. 2	Embargo Creek	1881	2.00	80	2						45	
190	Cadde No. 1.	Rock Creek	1881	1.50	75	3						20	
191	Ladd	Embargo Creek	1881	1.00	35	1						80	
192	Boger	do	1881	1.80	70	2						160	
193	Bachman and Seitz	do	1881	2.00	80	3						180	
194	Deekman No. 2	Spring Creek	1881	1.00	50	1						120	
195	Montoya No. 5	Pinos Creek	1881	1.00	50	2						20	
196	Seitz	Embargo Creek	1881	1.00	40	3						80	
197	Church	Rio Grande	1881	1.02	175	2						200	
198	Rio Grande Canal	do	1882, 1885, 1886, 1887, 1888, 1889, 1890, 1891, 1892	1,050.00	60,000	1,500	180	340	36,000	150	2	43,200	1881, 1; 1889, 0.02; 1892, 515.40; 1895, 22.80; 1896, 22.80; 1897, 26; 1898, 33.00; 1899, 41; 1900, 43.40; 1901, 52; 1902, 263.70.
199	John Nelson	do	1882	8.00	1,000	12	120		700	100	7	1,400	1882, 31.16; 1884, 7.20; 1885, 11.20; 1886, 4.30; 1887, 2.00; 1889, 3.50 1890, 31.70
200	Rio Grande and Lar- pet.	do	1882, 1884, 1885, 1886, 1887, 1888, 1890	91.06	4,000	55	120	50	3,800	150	50	13,200	
201	Marble	Rio Grande	1882	4.80	300	10						400	
202	Prosser-Mc-	Pinos Creek	1882	1.00	50	2						150	
203	MacLead No. 2	San Francisco Creek	1882	411.74	45,000	650	172	320	10,500	100	100	20,000	
204	Monte Vista Canal	Rio Grande	1882, 1886, 1887, 1888, 1889, 1890									8,845	
205	Kernan	Pinos Creek	1882	70	35	2						15	
206	MacLead No. 4	San Francisco Creek	1882	70	35	1						30	
207	Strickland	Pinos Creek	1882	1.00	50	1						15	
208	MacLead No. 3	San Francisco Creek	1882	1.80	90	1						15	
209	MacLead No. 6	San Francisco Creek	1882	1.00	50	1						40	
210	Colo No. 6	do	1882	1.00	50	1						40	
211	Hillshale	Rock Creek	1882	1.00	50	1						10	
212	Cemetery	Rio Grande	1882	1.00	80	2						135	
213	Dunning Mill	San Francisco Creek	1882	1.50	75	2						45	
214	Empire Canal	Rio Grande	1882	.60								70	
215	Empire Canal	do	1883, 1887, 1888, 1889, 1891	804.18	50,000	1,000	184	350	10,000	50	100	10,000	1882, 0.30; 1886, 1.20; Included in totals of Rio Grande Canal.
												7,450	1887, 37.18; 1888, 17.30; 1890, 436.46; 1891, 20.

215	Alamosa Town	1893	12.80	12	Has not used water since 1892.
216	Sheridan South	1893, 1897, 1892	8.00	4	1893, 1; 1897, 2; 1892, 5.
217	Vernon	1893, 1900	3.80	100	1893, 1; 1900, 2.80.
218	do	1893	1.00	100	
219	Sheridan North	1893	1.00	100	
220	Fuchs	1893	2.00	70	
221	Pinon Creek	1893	2.20	110	
222	Rock Creek	1893	4.17	45	
223	do	1893	2.80	75	
224	Cole No. 3	1893	.65	10	
225	Cole No. 4	1893	.80	15	
226	do	1893	.80	15	
227	Knoblauch	1894	1.20	40	
228	San Luis Valley	1894, 1898, 1899, 1901, 1902	416.30	184	1894, 50.30; 1898, 85.00; 1899, 102.70; 1901, 0.50; 1902, 110.90.
229	Hickory Jackson	1894, 1899	36.00	29	1894, 10; 1899, 17.
230	Spring Creek No. 1	1894, 1898	12.80	10	1894, 6.40; 1898, 6.40.
231	Dupke No. 1	1894	1.04	15	
232	Kiel, Larsen & Gardner	1894	1.20	35	
233	Pinon Creek	1894	1.00	25	
234	Rock Creek	1894	2.08	25	
235	Cat Creek	1894	1.00	50	
236	Arroyo, from Rock Creek	1895	7.80	75	
237	do	1895	2.08	25	
238	do	1895	25.00	30	
239	do	1895	36.51	30	
240	do	1895	1.00	100	
241	do	1895	1.00	100	
242	do	1895	1.00	100	
243	do	1895	1.00	100	
244	do	1895	1.00	100	
245	do	1895	1.00	100	
246	do	1895	1.00	100	
247	do	1895	1.00	100	
248	do	1895	1.00	100	
249	do	1895	1.00	100	
250	do	1895	1.00	100	
251	do	1895	1.00	100	
252	do	1895	1.00	100	
253	do	1895	1.00	100	
254	do	1895	1.00	100	
255	do	1895	1.00	100	
256	do	1895	1.00	100	
257	do	1895	1.00	100	
258	do	1895	1.00	100	
259	do	1895	1.00	100	

List of ditches in District No. 20, Colorado—Continued.

No.	Name.	Stream.	Date of first use.	Decree.	Possible acreage.	Capacity.	1895.		1906.		Remarks.
							Days.	Per day.	Days.	Per day.	
230	Perkins	Pinos Creek	1888	5.00	280	5					
231	Bennett, No. 3	Cherry Creek	1888	.80	40	2					
232	Cole, No. 3	Rock Creek	1888	.76	30	2					
233	Newton	do	1888	10.00	400	8					
234	Spring Branch	Spring Branch Creek	1888	.90	40	1					
235	Keudworth	Rio Grande	1888	137.05	10,000	100	180	100	30	20	
236	Brey	do	1899	1.00	100	11			120	3	
	Total			5,561.75	252,520	6,034			104,735	257,270	181,705

List of ditches in District No. 21, Colorado—Continued.

No.	Name.	Stream.	Date of first use.	Decew. acre.	Pross. acre age.	1886.			1887.			Remarks.
						Days.	Per day.	Acres.	Days.	Per day.	Acres.	
1	El Viejo	Alamoso River	1868	10.20	600	180	9	1,000	400	80	1,440	300
2	Gomez	do	1868	4.62	90	4	3	400	100	80	320	30
3	Molina	do	1869	6.93	70	4	3	80	20	80	20	20
4	Hansen-La Jara Over-flow No. 3.	La Jara River	1870	21.28	1,350	150	10	3,000	1,320	80	1,280	1,220
5	Swamp	do	1870	2.49	1,000	150	2	600	980	80	320	800
6	Granda No. 1	do	1870	4.62	250	4	3	520	130	80	120	120
7	McVannif	do	1870	16.60	300	8	25	1,000	250	60	780	220
8	Joe Voldez	Alamoso River	1870	18.50	200	8	18	1,220	80	75	280	720
9	Voldez	do	1870, 1887	86.63	1,500	125	15	3,750	840	60	960	405
10	Cuplen	do	1870	31.37	800	15	10	1,440	185	60	680	170
11	Gabinio Gallagos	do	1870	16.00	400	10	10	1,440	185	60	680	170
12	Volley	La Jara River	1870	21.02	400	6	125	2,500	350	55	275	320
13	Garcia No. 2	Alamoso River	1870	5.54	120	4	2	200	55	40	300	50
14	San Jose No. 2	do	1871	3.08	50	3	10	300	50	40	300	50
15	Cristobal Reynera	do	1873	10.08	220	6	15	240	60	30	200	50
16	Jose E. Atensio.	Hot Creek	1873	6.93	150	8	125	3,000	145	45	270	130
17	San Jose No. 1	Alamoso River	1873	10.30	150	8	100	640	160	35	245	145
18	Romero	La Jara River	1873	7.68	100	5	100	1,000	100	65	200	100
19	Gallagos No. 4	do	1873	11.08	100	5	100	320	80	40	300	75
20	Gallagos No. 2	Hot Creek	1873	12.32	100	5	100	280	70	35	150	135
21	Juan de Dios Vigil.	La Jara River	1873	11.08	100	5	100	320	80	40	300	75
22	Gallagos No. 1	do	1873	11.08	100	5	100	320	80	40	300	75
23	Newcomb Bros.	La Jara River	1873, 1877	18.08	600	6	93	1,080	150	30	25	140
24	Romaldo Voldez.	Alamoso River	1873	6.62	70	4	100	620	155	45	315	140
25	Le-Mita No. 1	La Jara River	1874	9.55	100	7	125	2,400	450	30	360	410
26	Ramona	do	1874	9.55	100	7	125	180	45	35	190	40
27	Head Overflow No. 5	Alamoso River	1874	49.80	2,000	20	90	2,900	2,000	29	8	405
28	Le Mita No. 3	Hot Creek	1874	6.16	100	4	90	240	60	29	25	45
29	Alamoso and Spring Creek.	Alamoso River	1875, 1877, 1880, 1887.	62.74	1,600	125	20	5,000	840	30	12	720
30	Garden	Spring Creek	1875	8.10	80	4	50	200	50	30	180	50
31	Agua Caliente	Hot Creek	1875	15.40	100	8	90	280	70	28	110	60
32	Ortiz	Alamoso River	1875	14.02	320	10	100	920	230	35	280	280
33	Eskridge	Spring Creek	1875	3.36	200	2	100	40	180	35	140	160
34	Creek.	do	1875	6.93	60	4	80	140	35	35	105	30
35	Sanchez No. 1	Hot Creek	1875	6.93	20	4	80	160	15	35	15	40
36	Sanchez No. 2	do	1875	53.12	800	25	100	3,200	840	30	10	715
37	Arroyo	Alamoso River	1876	6.93	100	4	50	250	90	30	210	80
38	T. K. Walsh	do	1876, 1882, 1884, 1887.	262.64	4,000	50	150	11,250	2,800	35	15	1,050
	Union	do										145.00.

1873, 11.52; 1877, 7.16.

2,000 gross, 500 sheep age.

1875, 5.76; 1877, 18.14; 1880, 12.62; 1887, 26.22.

1876, 14.13; 1882, 27.21; 1884, 76.30; 1887, 145.00.

List of ditches in District No. 21, Colorado.

No.	Name.	Stream.	Date of first use.	Possibility acreage.	1865.			1866.			Remarks.
					Days.	Per day.	Acres.	Days.	Per day.	Acres.	
39	Levett	Alamoso River	1876	150	4	90	3	60	30	4	50
40	North Alamoso	do	1877, 1887	40 79	11	90	10	600	30	8	480
41	Sanco	La Jara River	1878	9 60	6	90	4	720	45	4 5	500
42	Cottonwood	Alamoso River	1879	33 70	25	90	20	1,200	30	7 5	405
											1,000
43	Walsh	do	1880	85	4	80	4	280	30	3 5	210
44	Gallagos No. 3	do	1880	550	8	50	8	1,440	30	2 5	150
45	Penasco	La Jara River	1880	30	2	50	1	80	35	1 5	480
46	La Piedra	do	1880	4	80	3	400	100	35	1 5	15
47	Palo Real	do	1880	180	5	80	4	400	35	2 25	85
48	Thickfeld	Alamoso River	1880	7 20	4	80	4	320	35	2 25	70
49	Alamoso No. 1	do	1880, 1887	7 68	4	50	3	200	30	4	85
50	Eckridge and Garrett	La Jara River	1880	1,000	8	60	8	960	30	5 5	240
				500	6	60	5	600	30	4	365
51	Le Mita No. 2	do	1880	200	5	80	3	280	30	2	60
52	Hardack	do	1881	18 45	10	80	8	1,440	28	9 25	520
53	Lowland	do	1881	14 94	8	80	8	1,280	28	9 25	580
54	Clark	Alamoso River	1881	300	4	80	4	640	25	4	600
55	Alamos	La Jara River	1881	6 75	4	80	3	320	27	4	215
56	Overflow No. 4	do	1881	16 00	15	80	15	2,400	30	2 7	290
57	Nate Garrett	Alamoso River	1882, 1887	13 45	8	100	8	2,400	30	2 7	50
58	Lower La Jara	do	1883, 1884, 1887	44 82	15	80	15	2,400	27	3	725
											320
											2,650
59	Worcester	Alamoso River	1883	11 83	8	80	6	960	23	5	280
60	Overflow No. 2	do	1884	16 00	20	80	8	1,280	23	5	845
61	Norland	do	1885	48 56	22	80	15	2,400	23	5	240
62	Philman	do	1885	24 90	10	80	10	1,280	23	4	500
63	Miller	do	1885, 1887	66 40	12	80	12	3,840	27	6	750
64	Ed Newcomb	do	1886	112 00	35	80	35	8,400	27	6	310
65	Overflow No. 1	do	1886	13 28	40	80	40	6,400	27	11	680
66	Morganville	do	1886	29 75	6	80	6	480	23	10	1,450
67	Piano Vista	do	1886	51 87	15	125	15	3,750	23	5	520
68	Davis Chapman	do	1887	29 81	14	80	14	1,120	23	5	2,610
69	Scandinavian	do	1887	43 58	4	80	4	320	23	4	940
70	Alamoso Creek Canal	do	1887	166 05	20	70	20	1,400	23	10	1,370
71	Baker	do	1888	12 45	25	80	25	2,000	23	4	480
72	Coddington	do	1888	12 45	25	80	25	2,000	23	4	385
73	Ribborn	La Jara River	1888	28 80	10	80	10	800	23	8	1,885
74	Medril	Alamoso River	1888	12 45	15	80	15	1,200	23	11	1,325
75	Holario	do	1888	3 61	6	80	6	480	23	5	745
					2	80	2	160	23	5	700
											850
											270
											110
											49
											15
Total				65,545	799		100,050	41,550		26,335	37,940

DISTRIBUTION OF WATERS OF THE RIO GRANDE.

139

No.	Name.	Stream.	Date of first use.	Decree.	Possible acreage.	Capacity.	1896.			Remarks.
							Days.	Per day.	Acres.	
1	Guadalupe Main.	Conejos River	1855	40.82	1,920	32	150	20	6,000	1,730
2	Head's Mill and Irrigation	do	1855	7.14	200	10			800	200
3	El Colla.	San Antonio River	1856	25.18	1,000	15	150	10	3,000	1,000
4	Llano	Los Pinos Creek	1856	31.84	1,500	18	150	15	4,500	1,500
5	Garcia	Conejos River	1856	12.32	320	6	155	5	1,280	1856, 6.25; 1857, 6.00.
6	Serranilla	do	1856, 1887, 1888.	30.27	1,700	15	155	10	3,720	1856, 31.27; 1887, 4; 1888, 4.
7	Selodonia Volez M. and I	do	1856	31.77	280	6	155	5	880	
8	Los Pinos	Los Pinos Creek	1856	22.94	700	9	150	5	1,500	675
9	Seclar	Conejos River	1856	12.32	200	3	130	2	280	70
10	Mill	do	1856	12.67	200	6	150	4	400	100
11	San Jose.	do	1856	40.28	1,100	18	120	8	1,920	1,045
12	San Jose.	San Antonio River	1856	18.31	1,300	18	70	12	1,350	1,350
13	Del Puertito	Conejos River	1856	8.76	240	3	130	2	520	130
14	San Rafael and Conejos	do	1856, 1862, 1863	21.62	1,400	12	140	4	610	160
15	El Senillo	do	1856	6.19	280	3	120	2	480	280
16	Gabriel Martinez	do	1857	7.1	180	3	120	2	1,920	115
17	Santiago	do	1857	55.50	640	12	120	8	420	550
18	Archuleta & Trujillo, No. 1	do	1857	8.81	120	3	85	2.5	210	210
19	Archuleta & Trujillo, No. 2	Natural Springs	1857	11.94	100	6	85	2.5	430	290
20	Overflow	Conejos River	1857	53.48	460	9	100	3	600	100
21	Trujillo	do	1857	42.89	1,500	8	125	4	750	465
22	Canon Irrigating	do	1857	31.44	1,000	8	125	3.5	1,000	250
23	La Del Rio	San Antonio and Conejos	1857	22.25	600	12	90	10	1,800	750
24	Rincones	do	1858	31.47	520	9	90	5	900	415
25	Puertito.	do	1858	38.90	1,840	16	120	10	1,000	270
26	Mercedes	do	1861	51.76	1,840	20	120	10	2,400	600
27	San Juan and San Rafael	Natural Springs	1861, 1880	19.54	100	3	10	2	40	70
28	Espinosa	Conejos River	1862	18.31	100	3	90	3	3,000	160
29	Chacon No. 1	do	1862	18.31	100	3	90	3	540	160
30	Las Saucos	do	1867	88.43	480	15	130	10	3,000	3,250
31	Llave & Irrigating	San Antonio River	1867	27.58	480	7	40	7	500	430
32	Jose Bonifacio Romero.	Conejos River	1870, 1880	81.97	4,000	20	120	10	1,000	250
33	Bernardo Romero	do	1870	9.26	500	3	120	3	320	80
34	Gabalis	Los Pinos Creek	1870	10.97	200	6	150	3	840	200
35	Sanchez	Conejos River	1871	27.26	800	10	140	3	840	800
36	J. F. Chacon No. 3	do	1872	18.31	80	6	90	2	320	80
37	Sabine School Section	do	1873	11.05	320	6	70	3	420	220
38	Jose Decedario Martinez	Natural Springs	1874	9.26	110	3	75	2	240	110
39	Vega Grande.	Conejos River	1873, 1878	11.30	320	6	85	2.5	425	300
40	An Con Irrigating	do	1876, 1885, 1888	25.81	1,000	20	90	12	2,160	900

1870, 5.77; 1878, 5.77.
 1876, 10.80; 1885, 8.00; 1888,
 11.04.

List of ditches in District No. 22, Colorado—Continued.

No.	Name.	Stream.	Date of first use.	Decree, acreage.	Capacity.	1896.				Remarks.
						Days.	Per day.	Acre-foot.	Acres.	
41	Wm. Stewart & Co. Ir.	Conejos River and springs	1876.	11.40	300	60	3	300	300	
42	J. F. Chacon No. 2	Conejos River	1877, 1879, 1884, 1889.	16.08	900	85 75 60	3 4 2.5	510 600 300	180 370 80	1877, 7.54; 1879, 4.54; 1884, 2.00; 1889, 2.00.
43	Loroto.	Natural spring	1878.	7.54	200	100	2	600	200	
44	McCarroll	Conejos River	1878.	13.72	100	40	2	160	40	
45	Manassa.	do	1879.	73.60	1,000	120	8	1,920	1,575	
46	Wm. Sabine No. 1	do	1880.	7.71	180	70	3	320	80	
47	Martinez	do	1890.	15.84	880	75	10	1,500	730	
48	J. M. Espinosa	Natural springs	1890.	26.00	120	3	2.5	490	115	
49	Cordova	Conejos River	1890.	6.54	220	6	75	450	225	
50	Chavez	San Antonio River	1890.	12.72	640	85	3	510	430	
51	Jack's Irrigating	Conejos River	1891.	8.12	120	6	70	380	95	
52	Ephraim.	do	1891.	47.00	2,700	120	4	960	2,700	
53	Martinez (on San Antonio)	San Antonio River	1891, 1898.	30.68	640	6	4	480	200	1891, 13.68; 1898, 26.
54	Los Ojos No. 2	Conejos River	1891.	5.95	4,200	6	150	1,200	4,200	2,000 acres by seepage.
55	Richfield Canal	do	1892, 1896.	108.74	5,000	80	50	8,000	2,510	1892, 56.24; 1896, 112.40.
56	Loma Padre	do	1892.	10.31	700	50	5	500	700	
57	Bancroft	do	1892.	7.54	180	4	70	280	110	
58	Wm. Sabine No. 2	do	1892.	7.71	100	5	70	350	70	
59	Los Ojos No. 1	do	1892.	44.16	880	15	70	1,120	880	
60	Eldredge	do	1893.	7.52	200	7	60	420	140	
61	Augustura	do	1893.	42.72	160	3	90	180	50	
62	Northwestern	do	1893, 1896, 1898.	122.80	20,000	180	4	1,440	720	1893, 34.71; 1896, 41.25; 1898, 46.84.
63	La Vega de la Serrietta	do	1893.	6.75	160	3	70	420	120	
64	Cruz Chavez	do	1893.	1.00	160	3	70	420	120	
65	La Manga	do	1893, 1894, 1896.	10.00	640	2	2	240	110	1893, 4; 1894, 4; 1896, 2.
66	Broyle's Overflow No. 1	do	1893.	1.50	40	60	5	100	40	
67	Broyle's Overflow No. 2	do	1893.	2.50	60	60	2	240	60	
68	Broyle's Overflow No. 3	do	1893.	1.50	40	60	2	180	60	
69	Jaramillo Overflow No. 1	do	1893.	2.00	80	60	1.5	240	80	
70	Jaramillo Overflow No. 2	do	1893.	2.00	80	60	2	240	80	
71	La Vega	Conejos River	1893, 1896.	11.40	180	60	2	360	80	1893, 8.40; 1896, 3.
72	McCarroll	Mill Creek	1893.	7.00	325	60	2	480	255	
73	Le Due	Conejos River	1893, 1899, 1900.	6.00	200	120	2	480	255	1893, 3; 1899, 2; 1900, 1.
74	Home	do	1893.	1.50	160	30	2	360	160	
75	Ball Bros. Overflow No. 1	do	1893.	22.00	3,000	30	2	960	3,000	1,000 acres by seepage.
76	Ball Bros. Overflow No. 2	do	1893.	22.00	3,000	30	2	960	3,000	1,000 acres by seepage.
77	Hughes's Overflow No. 1	San Antonio River	1893.	12.00	80	30	2	360	3,000	None.
78	Hughes's Overflow No. 2	do	1893.	12.00	80	30	2	360	3,000	None.
79	Manassa No. 2	Conejos River	1893.	23.25	1,100	120	2	1,440	1,000	
80	Floyd Overflow No. 1	San Antonio River	1893.	1.50	200	40	2	1,600	1,600	

List of ditches in District No. 24, Colorado.

No.	Name.	Stream.	Date of first use.	Decree.	Possible acreage.	Capacity.	1865.		1866.		Remarks.
							Acres.	Days.	Per day.	Acres.	
1	San Luis People's.	Culebra Creek.	1852	23.00	400	22	.....	165	10	1,480	370
2	San Pedro.	do	1852	19.50	480	23	.....	169	4	1,280	480
3	Acquila Madre	Castilla Creek	1853	22.50	1,000	26	.....	165	20	3,000	900
4	Montez.	Rito Seco.	1853	1.00	20	5	.....	140	1	40	10
5	Vallejos	Vallejos Creek.	1854	17.00	320	20	.....	165	8	1,280	320
6	Manzanares	Castilla Creek	1854	23.00	1,000	28	.....	165	21	3,680	920
7	Acquiencia	do	1855	1.00	50	1	.....	140	1	120	30
8	San Acocio	Culebra Creek.	1856	46.00	800	60	.....	100	12	2,920	730
9	Madriles	Castilla Creek	1856	12.00	500	14	.....	165	10	1,920	480
10	Cholla.	do	1857	10.00	400	12	.....	165	9	1,600	400
11	Cerro.	Culebra Creek.	1857	40.00	420	60	.....	160	12	1,600	400
12	Francisco Sanchez.	do	1858	12.50	180	13	.....	135	3	720	180
13	Mestas	Vallejos Creek.	1858	4.50	60	7	.....	140	1.5	240	60
14	San Francisco	San Francisco Creek	1860	16.00	400	20	.....	145	8	1,400	350
15	Trujillo.	Castilla Creek	1861	1.00	40	1	.....	90	1	80	20
16	Little Rock	San Francisco Creek	1873	1.00	40	1	.....	110	1	80	20
17	Garcia	Castilla Creek	1873	1.00	40	1	.....	90	1	125	30
18	Torcedo	do	1874	1.00	35	1	.....	120	0.5	120	35
19	Abudo Martin	Torcedo Creek.	1874	3.50	70	4	.....	160	2	320	80
20	Guadalupe Vigil	Vallejos Creek	1890	4.00	80	6	.....	145	0.5	80	20
21	J. M. J. Maez	Ventero Creek	1881	1.50	20	4	.....	165	0.5	60	15
22	Antonio Pando.	Culebra Creek.	1881	1.25	15	4	.....	90	0.5	240	100
23	Guadalupe Sanchez.	do	1883	3.25	120	6	.....	40	3	2,280	900
24	Main Eastdale	Castilla Creek	1880	.....	100	25	.....	95	12	2,280	900
25	South Eastdale	do	1880	.....	200	10	.....	90	4	720	200
Total							7,500	.....	.....	25,980	7,050
							9,500	.....	.....	.....	.....

None.

List of ditches in District No. 25, Colorado.

No.	Name.	Stream.	Date of first use.	De. croc.	Possi- ble acre- age.	Capac- ity.	1885.			1886.			Remarks.
							Days.	Per day.	Acres.	Days.	Per day.	Acres.	
1	Wells Middle	Kerber Creek	1886	.60	30	12	100	0.6	80	20	0.6	78	20
2	Wells North	do	1886	.40	20	16	100	0.4	80	20	0.4	52	20
3	Wells Kerber	do	1886, 1878, 1882, 1884.	9.00	450	244	100	9	1,720	65	9	1,170	430
4	Dittrich-Steele	San Luis Creek.	1867	1.40	70	4.5	30	1.4	255	70	1.4	182	70
5	Dittrich No. 1	do	1867	.20	10	4.5	90	0.2	30	10	0.2	26	10
6	Dittrich No. 2	do	1867	1.20	10	1	90	0.2	30	10	0.2	26	10
7	Dittrich No. 3	do	1867	1.00	50	2.7	90	1	180	50	1	120	50
8	Dittrich No. 4	do	1867	3.40	100	11.8	100	3.8	400	150	3.8	400	40
9	Steele No. 2	do	1867, 1873.	3.80	100	11.8	100	3.8	400	150	3.8	400	150
10	Hoffman	Cotton Creek	1868, 1870, 1875.	3.40	550	6.2	110	6.2	1,261	370	6.5	442	370
11	Neldhardt	do	1868, 1870, 1872, 1873, 1875.	10.40	550	13.7	110	9.2	2,024	500	16.4	1,352	550
12	Baca No. 3	North Crestone Creek	1829	4.00	200	12	110	4	780	195	4	520	195
13	Baca No. 4	South Crestone Creek	1869	7.00	350	22	110	7	1,400	350	65	910	350
14	Major Creek	Major Creek	1870	3.80	240	9.9	100	3.5	740	290	65	507	240
15	Garner No. 1	Garner Creek	1870	4.40	280	8.7	110	4.2	720	180	65	882	280
16	Cotton Creek	Cotton Creek	1870, 1872, 1873, 1874, 1875.	17.40	670	60	110	12	2,500	625	13.4	1,742	625
17	Baca No. 9	Crestone Creek	1870, 1888	29.00	1,950	53	100	39	7,800	1,950	39	5,070	1,950
18	Baca No. 11	do	1870, 1870, 1878.	9.00	450	10.2	100	9	1,800	450	9	1,170	450
19	Baca No. 12	do	1870, 1870, 1878, 1882, 1883, 1884.	41.20	2,210	23.7	100	44.2	8,840	2,210	44.2	5,746	2,210
20	Baca No. 13	do	1870	5.40	270	18	100	5.4	1,080	270	5.4	702	270
21	Wales & Shellabarger No. 1	Rito Alto	1870, 1872	6.60	280	65	110	5.6	1,660	285	5.6	728	285
22	Squires No. 1	San Luis Creek	1870	4.00	200	26.8	110	2	1,080	100	4	520	200
23	Baca No. 5	North Crestone Creek	1870, 1883	5.80	270	26.7	100	5.4	1,080	270	5.4	702	270
24	Baca No. 6	do	1870	4.00	200	6.7	100	4	800	200	4	520	200
25	Baca No. 7	do	1870	4.00	200	11.2	100	4	800	200	4	520	200
26	Baca No. 14	South Branch Isabel Creek	1870	3.92	195	3.9	100	3.9	780	195	3.9	507	195
27	Baca No. 15	Willow Creek	1870	29.00	1,450	38.6	100	29	5,800	1,450	29	3,770	1,450
28	Baca No. 16	do	1870	29.00	1,300	27.7	100	29	5,200	1,300	29	3,380	1,300
29	Baca No. 17	do	1870	11.00	580	11.6	100	11.6	2,320	580	11.6	1,308	580
30	Baca No. 18	do	1870	2.40	120	7.2	100	2.4	480	120	2.4	312	120
31	Baca No. 19	Spanish Creek	1870	29.80	1,900	48.1	100	29.8	6,000	1,900	29.8	5,174	1,900
32	Baca No. 20	do	1870	5.40	270	25.4	100	5.4	1,080	270	5.4	702	270

List of ditches in District No. 25, Colorado—Continued.

No.	Name.	Stream.	Date of first use.	De-crec.	Pross-ible acre-ages.	Capac-ity.	1895.			1906.			Remarks.
							Days.	Per day.	Acres.	Days.	Per day.	Acres.	
33	Baca No. 21	Cottonwood Creek	1870	4.00	200	7.8	100	4	800	65	10.2	520	1870, 10.00; 1889, 20.00.
34	Baca No. 22	do	1870	70.00	3,000	70	100	50	10,000	65	70	9,100	3,560
35	Baca No. 23	do	1870	20.40	30.6	30.6	100	20	4,000	65	20.4	2,652	1,020
36	Baca No. 24	Deadman Creek	1870, 1889	30.00	1,950	40.3	100	30	6,000	65	30	5,070	1,950
37	Baca No. 25	do	1870	24.00	510	45	100	10.2	2,000	65	10.2	1,225	510
38	Baca No. 26	do	1870, 1889	30.80	1,040	29.1	100	20.8	4,100	65	20.8	2,704	1,040
39	Baca No. 27	do	1870	2.75	140	2.8	100	2.8	500	65	2.7	351	140
40	Baca No. 28	do	1870	1.00	150	1	100	3	600	65	3	130	150
41	Clayton P.	Kerber Creek	1870	1.80	40	5	110	0.8	175	65	1.8	254	60
42	San Isabel	San Isabel Creek	1870, 1872, 1874, 1876, 1886	14.00	745	25	110	14.9	2,820	65	14.9	1,937	705
43	North	do	1870, 1874, 1876, 1887	8.80	465	13	100	8.9	1,780	65	8.9	1,157	465
44	Baca No. 8	South Crestone Arroyo	1870	3.80	100	3.8	100	3.8	700	65	3.8	404	100
45	Wales and Travis	Rito Alto	1870, 1874, 1883, 1887	18.86	945	29	100	18.8	3,700	65	18.8	2,444	945
46	Wales No. 1	do	1870	1.00	50	20	100	1	300	65	1	120	50
47	Wales No. 2	do	1870, 1873	1.80	90	52.5	100	1.8	300	65	1.8	235	90
48	Baca No. 19	Crestone Creek	1870, 1888	30.40	1,950	51.5	100	30.4	7,800	65	30.4	5,122	1,950
49	Wales & Sheehar-gor No. 2	Rito Alto	1870, 1872, 1879, 1884, 1887	36.00	1,800	69	100	36	7,300	65	36	4,680	1,800
50	Schultz-Dittrich	San Luis	1870, 1873, 1880	11.20	575	42.4	100	10	2,000	65	11.2	1,456	575
51	San Luis Co	do	1871, 1874	12.75	670	40.8	120	12.7	2,680	65	12.7	1,651	670
52	Steele Creek	Steele Creek	1871	4.20	210	20.5	110	4.2	720	65	4.2	546	210
53	Hot Spring Creek	Hot Spring Creek	1871	3.96	195	4	125	3.9	780	65	3.9	483	195
54	Clayton E.	Cottonwood Creek	1872	4.00	215	4.9	100	4	800	65	4	520	215
55	Clayton D.	Kerber Creek	1872	4.40	295	6	100	4.4	880	65	4.4	572	295
56	Petersons No. 1	Wild Cherry Creek	1872, 1874, 1875, 1884	14.80	745	52	120	14.9	2,700	65	14.9	1,937	745
57	Wales No. 3	Rito Alto	1872, 1887	5.50	275	17	120	5.5	1,100	65	5.5	715	275
58	Schilling	Spring Brook, San Luis Creek	1872	2.80	140	10	100	2.8	560	65	2.8	364	140

No.	Shells	Home	Rito Alto	1873	1874	1875	1876	1877	1878	1879	1880	1881	1882	1883	1884	1885	1886	1887	1888	1889	1890	1891	1892	1893	1894	1895	1896	1897	1898	1899	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109	2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120	2121	2122	2123	2124	2125	2126	2127	2128	2129	2130	2131	2132	2133	2134	2135	2136	2137	2138	2139	2140	2141	2142	2143	2144	2145	2146	2147	2148	2149	2150	2151	2152	2153	2154	2155	2156	2157	2158	2159	2160	2161	2162	2163	2164	2165	2166	2167	2168	2169	2170	2171	2172	2173	2174	2175	2176	2177	2178	2179	2180	2181	2182	2183	2184	2185	2186	2187	2188	2189	2190	2191	2192	2193	2194	2195	2196	2197	2198	2199	2200	2201	2202	2203	2204	2205	2206	2207	2208	2209	2210	2211	2212	2213	2214	2215	2216	2217	2218	2219	2220	2221	2222	2223	2224	2225	2226	2227	2228	2229	2230	2231	2232	2233	2234	2235	2236	2237	2238	2239	2240	2241	2242	2243	2244	2245	2246	2247	2248	2249	2250	2251	2252	2253	2254	2255	2256	2257	2258	2259	2260	2261	2262	2263	2264	2265	2266	2267	2268	2269	2270	2271	2272	2273	2274	2275	2276	2277	2278	2279	2280	2281	2282	2283	2284	2285	2286	2287	2288	2289	2290	2291	2292	2293	2294	2295	2296	2297	2298	2299	2300	2301	2302	2303	2304	2305	2306	2307	2308	2309	2310	2311	2312	2313	2314	2315	2316	2317	2318	2319	2320	2321	2322	2323
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List of ditches in District No. 25, Colorado—Continued.

No.	Name.	Stream.	Date of first use.	De- crec- age.	Prodi- ble accre- age.	Capac- ity.	1895.			1896.			Remarks.
							Days.	Per day.	Acres.	Days.	Per day.	Acres.	
107	Shewalter No. 2	San Luis Creek	1879	80	40	3	90	0.8	145	40	0.8	104	40
108	Ross	do	1879	4.70	255	15.3	110	4.7	940	235	4.7	611	235
109	Briley	Kerber Creek	1880	1.20	60	1.7	100	0.6	216	60	1.2	60	60
110	Cash	North Crestone Creek	1880	.60	30	2.4	100	0.6	120	30	0.6	78	30
111	Hopkins	do	1880	1.20	5	5.3	100	0.1	25	5	0.1	13	5
112	Silver Creek	do	1880	2.00	100	20	100	2	380	95	2	200	95
113	Noeland Creek	do	1880	2.40	120	6	110	2.4	480	120	2.4	312	120
114	Shellbarger No. 2	Rito Alto	1880	4.80	240	18.3	110	4.8	960	240	4.8	624	240
115	Means No. 1	Alder Creek	1880	.70	45	7	50	0.9	90	45	0.9	45	45
116	Stump No. 1	Clover Creek	1880	.50	25	3.4	50	0.5	90	25	0.5	65	25
117	Stump No. 2	do	1880	.12	5	3.5	50	0.1	18	5	0.1	13	5
118	Stump No. 3	do	1880	.20	15	1	50	0.2	30	15	0.2	26	15
119	Squires No. 2	San Luis Hot Springs	1880	.40	40	2.2	50	0.8	80	40	0.8	104	40
120	Allen	Crestone Creek	1880	1.60	80	4.6	100	1.6	320	80	1.6	288	80
121	Means No. 2	San Luis Creek	1880	.30	15	2	50	0.3	30	15	0.3	30	15
122	McFarland A and B	Engle Brook and But- terfly Creek.	1881	6.80	340	8	100	4.9	960	250	4.4	572	250
123	Barsch No. 1	Break Creek	1881	1.60	80	13.1	60	1.6	102	75	1.6	288	75
124	Robinson	Spring Creek	1881	1.80	90	2.4	70	1.8	252	70	1.8	234	70
125	Robinson & Reese	do	1881	2.20	100	2.3	60	2	240	60	2	200	60
126	Robinson & Reese, jr	do	1881	1.00	50	4	50	1	100	45	1	130	45
127	Davison No. 3	Raspberry Creek	1881	1.16	10	6	80	0.2	20	5	0.2	26	5
128	Henry White	Spring Creek	1881	1.00	35	11	75	0.7	105	35	0.7	91	35
129	Clark A	Kerber Creek	1881	2.20	340	8	90	3	540	300	3	906	355
130	Turner	Kerber Creek	1881	1.20	60	6.5	60	1.2	144	55	1.2	156	55
131	Richard No. 1	West Spring Creek	1881	1.20	60	7.7	50	1.2	120	50	1.2	156	55
132	Ridenour	Spring near Garner Creek.	1881	1.60	80	2.1	120	0.6	80	30	0.6	78	30
133	Davison No. 2	Spring Creek	1881	.60	30	5	80	0.6	95	25	0.6	78	25
134	Barbery Talder	Cedar Creek	1882	.80	40	9.3	90	0.8	100	25	0.8	104	25
135	Kennedy No. 3	San Luis Creek	1882	1.00	50	8	50	1	40	20	1	120	20
136	Geo. C. Travis	Cedar Creek	1882	.08	5	22.8	20	0.2	8	5	0.2	13	5
137	Richard No. 2	East Spring Creek	1882	2.24	100	6.9	30	2	300	90	2	230	90
138	Clayton G	Kerber Creek	1883	2.00	100	3	120	1.8	324	90	1.8	254	90
139	De Camp	San Luis Creek	1883	.60	30	3.5	100	2	360	95	2	260	95
140	Kaufman	Kelley Creek	1883	2.00	100	1	100	0.4	80	20	0.4	32	20
141	White	Little Kerber Creek	1884	.80	40	2	140	0.8	160	40	0.8	104	40
142	Davison No. 1	Spring Creek	1884	.80	40	2.4	140	0.8	160	30	0.8	80	30
143	Charles	North Crestone Creek.	1884	.70	35	4	100	0.7	130	30	0.7	91	30
144	Malcolm	Alder Creek	1884	1.60	80	12	100	1.6	128	30	1.6	288	30
145	Barsch No. 2	do	1884	1.60	80	12	100	1.6	128	30	1.6	288	30

1891, 4; 1895, 3, 30.

117	Nash	San Isabel Creek	1884, 1888	5.00	250	13	100	3.5	700	175	65	3.5	455	175
118	H. C. Ridenour No. 1	Spring near Major Creek	1884	1.30	65	2,2	100	1.3	200	50	65	1.3	160	50
119	John De Camp B.	San Luis Creek	1884	.60	35	1	75	0.6	90	35	65	0.6	78	35
120	Ewing	San Isabel Creek	1884	1.90	95	10	70	1.9	265	95	95	1.9	247	95
121	Clark "B."	Yankes Creek	1884	3.20	160	4	60	3.2	384	160	65	3.2	416	160
122	Clayton "C."	Kelley Creek	1884	3.60	180	6	110	3.5	620	155	65	3.6	498	155
123	Stump No. 4	Lover Creek	1885	.20	10	3	110	0.2	20	5	65	0.2	36	5
124	Stump No. 5	San Luis Creek	1885, 1886	3.60	180	3	130	2.8	108	70	65	2.8	364	70
125	Stump	Clover Creek	1885	.20	10	1	110	0.2	44	10	65	0.2	26	10
126	Prairie Dog	Spring Creek	1885	.60	30	3.5	25	0.6	30	15	65	0.6	78	30
127	Norris	Kerber Creek	1886, 1888	2.70	135	3	75	2.7	465	120	65	2.7	350	120
128	Reese Irriigating	Spring Creek	1886	2.40	120	6	50	2.4	240	120	65	2.4	312	120
129	Braley	San Luis Creek	1886	1.40	70	4	40	1.9	152	70	65	1.9	182	70
130	Jordan No. 2	Kerber Creek	1887	.80	40	12	25	0.8	40	40	65	0.8	104	40
131	Alder No. 1	Kelly Creek	1887	2.80	140	15	10	2.8	56	140	65	2.8	364	140
132	Alder Creek	Alder Creek	1887	1.50	75	10	90	1.5	270	75	65	1.5	195	75
133	H. C. Ridenour No. 2	Major Creek	1888	1.30	65	7	90	1.3	130	65	65	1.3	169	65
134	Finazzo	San Isabel Creek	1888	4.00	200	7	90	4	720	190	65	4	520	190
135	Doray No. 1	Carpenter Creek	1888	.40	20	3	40	0.4	32	20	65	0.4	52	20
136	Doray No. 2	do	1888	.40	20	2.4	30	0.4	25	20	65	0.4	52	20
137	Doray No. 3	do	1888	.44	20	2.7	20	0.4	16	10	65	0.4	52	20
138	Swidensky	Gosselberry Creek	1888	.60	30	5	20	0.6	60	30	65	0.6	78	30
139	Cody	Kerber Creek	1888	.30	15	1.5	25	0.3	45	15	65	0.3	39	15
140	Hall No. 2	San Luis Creek	1889	1.60	80	4.8	90	1.6	288	80	65	1.6	298	80
141	Carver	Major Creek	1889	1.50	75	2.2	75	1.5	225	75	65	1.5	195	75
142	Ditches without de- crees (number un- known).			1,800	45				3,000	1,515			2,400	1,625
	Total			919.18	47,615	2,501.3			161,975	42,940			118,100	46,285

List of ditches in District No. 26—Colorado.

No.	Name.	Stream.	Date of first use.	Decree.	Possible acreage (a).	Capacity.	1866.			Remarks.
							Days.	Per day.	Acres.	
1	Malone Sullivan No. 1	Saguache Creek	1846	5.20	.....	20	.....	.....	.....
2	Heimberger No. 1	do	1846	.30	.....	1	.....	.....	.....
3	Heimberger No. 2	do	1846	.80	.....	6	.....	.....	.....
4	Cato	do	1846	.42	.....	8	.....	.....	.....
5	Hazard No. 1	do	1846	.10	.....	4	.....	.....	.....
6	Hazard No. 2	do	1846	.10	.....	2	.....	.....	.....
7	Malone	do	1846	.10	.....	2	.....	.....	.....
8	Lawrence Arroyo	do	1847	2.40	.....	12	30	2	120	50
9	Malone Sullivan No. 2	do	1847	0.20	.....	15	20	3	120	100
10	Luengen Sullivan	do	1847	1.56	.....	12	.....	.....	.....
11	Gotthelf No. 1	do	1847	3.70	.....	6	.....	.....	.....
12	Russell No. 4	do	1847	5.60	.....	12	15	3	60	145
13	Ashley & Profit	do	1847	8.20	.....	11	15	11	320	200
14	Profit Company	do	1848	6.00	.....	6	25	6	250	240
15	Fullerton No. 1	do	1848	6.00	.....	7	25	1	300	310
16	Stables & Gullago	do	1848	7.00	.....	10	25	3	50	50
17	Charles Lateral	do	1849	4.40	.....	4	15	3	30	100
18	Russell Company	do	1849	6.20	.....	8	25	2	100	100
19	Spencer	do	1850	6.20	.....	20	25	6	300	165
20	Ford	do	1850	12.40	.....	30	25	2	100	125
21	Mears No. 5	do	1870	1.00	.....	4	.....	.....	.....
22	Mears No. 4	do	1870	2.00	.....	3	15	1.5	45	75
23	Ward Highline	do	1871	3.70	.....	3	25	3	150	100
24	Mountainfield	do	1871	4.00	.....	8	.....	.....	.....
25	Brown Bros. No. 1	do	1871	2.50	.....	4	15	8	240	465
26	Brown Bros. No. 2	do	1871	2.50	.....	4	15	4	120	135
27	Gotthelf No. 3	Saguache Creek	1871	3.20	.....	4	25	4	200	100
28	Gotthelf No. 4	do	1871	3.20	.....	4	25	1	50	40
29	Manchego	do	1871	2.50	.....	3	25	2	100	100
30	Hodding No. 3	do	1871	2.50	.....	3	15	1	30	40
31	Hodding No. 4	Hodding Creek	1871	1.20	.....	6	15	4	120	240
32	Wall	Saguache Creek	1872	11.50	.....	12	25	12	600	325
33	Profit McDonough	do	1872	2.20	.....	6	15	3	90	100
34	Jeep & Scandrett	do	1872	4.00	.....	6	15	6	180	100
35	Taylor & Ashley	do	1872	4.00	.....	5	20	5	200	225
36	Morrison	do	1872	2.50	.....	8	10	3	90	100
37	Moses Goff No. 1	do	1872	3.00	.....	8	15	3	90	130
38	Moses Goff No. 2	do	1872	3.00	.....	8	15	3	90	130
39	Moses Goff No. 3	do	1872	2.00	.....	8	15	2	60	105
40	Garcia No. 1	do	1872	3.00	.....	15	.....	.....	.....
41	Van Allen	do	1872	2.00	.....	4	10	1	20	50
42	Houghtland Creek	do	1872	2.00	.....	2	20	1.5	60	70
43	Saguache Creek	do	1872	2.40	.....	6	.....	.....	.....
44	Blane & Scandrett	do	1872	2.40	.....	6	.....	.....	.....
45	Soble Co.	do	1872, 1875.	10.02	.....	9	15	9	270	200

1872, 1.40; 1875, 0.22

1868, 1.20; 1870, 2.40; 1872, 2.40

1870, 3.40; 1871, 5; 1872, 4.

DISTRIBUTION OF WATERS OF THE RIO GRANDE. 149

46	Roberts Co	do	1872	4.80	6	1	30	50	1873, 3.80; 1875, 1.80; 1877, 7.20.
47	Hartman Bros. No. 2	do	1873, 1875, 1877	12.80	20	15	20	30	1873, 4.00; 1888, 1.40.
48	Mill, McClure & Ashley	do	1873	1.00	2	15	20	30	1873, 3.00; 1882, 3.00.
49	do	do	1873, 1888	6.00	12	15	20	30	1873, 3.20; 1874, 1.00; 1875, 2.40; 1876, 0.80.
50	Hawking Bay	do	1873	6.00	12	15	20	30	1874, 8.40; 1875, 1.00; 1876, 1.32; 1877, 2.40; 1879, 6.30; 1881, 3.20.
51	Saguache Creek	do	1873, 1882	6.00	12	15	20	30	1874, 1.80; 1877, 3.00; 1886, 5.00.
52	Glottell Somora	do	1873	1.50	3	20	25	30	1875, 3.20; 1876, 0.80.
53	do	do	1873	2.28	4	20	25	30	1874, 8.40; 1875, 1.00; 1876, 1.32; 1877, 2.40; 1879, 6.30; 1881, 3.20.
54	Munro No. 2	do	1873	2.18	18	15	20	30	1874, 1.80; 1877, 3.00; 1886, 5.00.
55	Hartman Bros. No. 3	do	1873, 1874, 1875	8.00	20	15	20	30	1875, 3.20; 1876, 0.80.
56	Hongland	do	1876	3.40	30	15	20	30	1874, 8.40; 1875, 1.00; 1876, 1.32; 1877, 2.40; 1879, 6.30; 1881, 3.20.
57	Hartman Bros. No. 4	do	1874, 1875, 1876, 1877, 1879, 1881	24.00	35	20	25	30	1874, 1.80; 1877, 3.00; 1886, 5.00.
58	Ellis & Lamb	do	1874	2.80	6	15	20	30	1875, 3.20; 1876, 0.80.
59	Russell	do	1874	5.20	8	20	25	30	1874, 8.40; 1875, 1.00; 1876, 1.32; 1877, 2.40; 1879, 6.30; 1881, 3.20.
60	Jacques	do	1874	1.80	6	15	20	30	1874, 1.80; 1877, 3.00; 1886, 5.00.
61	Turnbull & Lucigen	do	1874, 1877, 1880	10.40	18	20	25	30	1875, 3.20; 1876, 0.80.
62	Reru	do	1874	1.00	2	15	20	30	1874, 8.40; 1875, 1.00; 1876, 1.32; 1877, 2.40; 1879, 6.30; 1881, 3.20.
63	Carruthers	do	1874	1.00	2	15	20	30	1874, 1.80; 1877, 3.00; 1886, 5.00.
64	Russell No. 2	do	1874	3.00	6	15	20	30	1875, 3.20; 1876, 0.80.
65	North Stubbs Ex. No. 3	do	1874	1.04	3	20	25	30	1874, 8.40; 1875, 1.00; 1876, 1.32; 1877, 2.40; 1879, 6.30; 1881, 3.20.
66	Hodding No. 2	do	1874	1.30	6	15	20	30	1874, 1.80; 1877, 3.00; 1886, 5.00.
67	Piquet No. 3	do	1874	1.00	6	15	20	30	1875, 3.20; 1876, 0.80.
68	Campbell No. 1	do	1874	4.00	20	15	20	30	1874, 8.40; 1875, 1.00; 1876, 1.32; 1877, 2.40; 1879, 6.30; 1881, 3.20.
69	Campbell No. 4	do	1875	2.50	5	20	25	30	1874, 1.80; 1877, 3.00; 1886, 5.00.
70	Mong No. 1	do	1875	8.40	9	20	25	30	1875, 3.20; 1876, 0.80.
71	Campbell No. 6	do	1875	8.40	9	20	25	30	1874, 8.40; 1875, 1.00; 1876, 1.32; 1877, 2.40; 1879, 6.30; 1881, 3.20.
72	Campbell Bros. No. 1	do	1875, 1881	6.10	30	15	20	30	1874, 1.80; 1877, 3.00; 1886, 5.00.
73	Irwin	do	1875	4.80	12	15	20	30	1875, 3.20; 1876, 0.80.
74	Werner A	do	1875	9.00	30	15	20	30	1874, 8.40; 1875, 1.00; 1876, 1.32; 1877, 2.40; 1879, 6.30; 1881, 3.20.
75	Downer No. 1	do	1875	2.00	10	6	1	1	1874, 1.80; 1877, 3.00; 1886, 5.00.
76	Piquet No. 6	do	1875	1.20	4	1	1	1	1875, 3.20; 1876, 0.80.
77	Lenders No. 1	do	1875	1.00	4	1	1	1	1874, 8.40; 1875, 1.00; 1876, 1.32; 1877, 2.40; 1879, 6.30; 1881, 3.20.
78	Mears No. 1	do	1875	1.30	3	1	1	1	1875, 3.20; 1876, 0.80.
79	Mears No. 2	do	1875	1.50	2	1	1	1	1874, 1.80; 1877, 3.00; 1886, 5.00.
80	Garcia No. 2	do	1875	1.40	6	1	1	1	1875, 3.20; 1876, 0.80.
81	Hodding No. 5	do	1875	1.50	6	1	1	1	1874, 8.40; 1875, 1.00; 1876, 1.32; 1877, 2.40; 1879, 6.30; 1881, 3.20.
82	Piquet No. 1	do	1875	1.00	6	1	1	1	1875, 3.20; 1876, 0.80.
83	John Shore	do	1875	1.00	12	15	20	30	1874, 1.80; 1877, 3.00; 1886, 5.00.
84	John Shane Arroyo	do	1876	5.00	20	15	20	30	1875, 3.20; 1876, 0.80.
85	Middle	do	1876	2.76	15	15	20	30	1874, 8.40; 1875, 1.00; 1876, 1.32; 1877, 2.40; 1879, 6.30; 1881, 3.20.
86	Saguache Creek	do	1876	2.76	15	15	20	30	1875, 3.20; 1876, 0.80.
87	Middle	do	1876	1.00	12	15	20	30	1874, 1.80; 1877, 3.00; 1886, 5.00.
88	Saguache Creek	do	1876	3.20	18	10	4	4	1875, 3.20; 1876, 0.80.
89	Ashley & Means	do	1876	3.30	18	10	4	4	1874, 8.40; 1875, 1.00; 1876, 1.32; 1877, 2.40; 1879, 6.30; 1881, 3.20.
90	O. Bergfield & Werner No. 1	do	1876	1.90	2	10	3	3	1875, 3.20; 1876, 0.80.
91	O. Bergfield & Werner No. 2	do	1876	1.90	2	10	3	3	1874, 1.80; 1877, 3.00; 1886, 5.00.
92	Gow & Dick	do	1876	1.80	1	1	1	1	1875, 3.20; 1876, 0.80.
93	Coleman South	do	1876	2.40	3	1	1	1	1874, 8.40; 1875, 1.00; 1876, 1.32; 1877, 2.40; 1879, 6.30; 1881, 3.20.

a These returns defective. See report for explanation of these tables.

DISTRIBUTION OF WATERS OF THE RIO GRANDE.

101

187	Plumet No. 15	Shelton Creek	1882	50	6	20	1.5	20	25	25
138	Monk No. 2	Saguache Creek	1882	1.50	3	3	1	3	3	3
139	Top	Harris Spring Creek	1882	2.40	3	3	1	3	3	3
140	Plumet No. 22	Middle Creek	1882	2.40	3	3	1	3	3	3
141	Plumet No. 23	do	1882	1.10	3	3	1	3	3	3
142	Holmes No. 2	Saguache Creek	1883	1.50	14	7	13	182	650	1883, 4.80; 1883, 3.20.
143	Holcomb	do	1883	10.00	14	20	1	40	50	
144	Lawrence No. 2	do	1883	4.40	6					
145	Lawrence No. 3	do	1883	2.40	4					
146	Plumet No. 12	Ford Creek	1883	2.40	4					
147	Plumet No. 21	Saguache Creek	1883	2.70	9					
148	Plumet No. 8	Middle Creek	1883	2.70	3					
149	Arroyo	Saguache Creek	1883	9.20	62					
150	Plumet No. 11	Ford Creek	1883	2.40	2					
151	Goodwin	Saguache Creek	1884	9.00	30					
152	Travis No. 1	do	1884	10.00	30					
153	Travis No. 2	do	1884	4.00	7					
154	Travis No. 3	do	1884	5.00	8					
155	Extension Goodlander	do	1884	1.00	2					
156	Freise No. 1	do	1884	2.20	2					
157	David Downer	do	1884	2.40	2					
158	Ford Creek No. 1	Ford Creek	1884	2.40	2					
159	Tuttle Creek No. 2	Tuttle Creek	1884	2.40	2					
160	Baxter Creek No. 3	Baxter Creek	1884	2.40	2					
161	Sheep Creek	Sheep Creek	1885	1.00	2					
162	Kirkendall & Rambo	Saguache Creek	1885	2.00	15	15	1	30	30	
163	Harcene No. 1	Mill Creek	1886	2.00	15	15	1	30	30	
164	Harcene No. 2	do	1886	2.00	15	15	1	30	30	
165	Harcene No. 3	do	1886	2.00	15	15	1	30	30	
166	Cartier No. 4	Saguache Creek	1886	2.40	1	5	3	30	160	
167	Bulen No. 1	do	1886	2.40	4					
168	Bulen No. 2	do	1886	2.40	4					
169	Phillips No. 1	do	1887	2.40	4					
170	Phillips No. 2	do	1887	2.40	4					
171	Kirkendall No. 2	do	1887	1.80	9					
172	Fry	do	1887	1.00	4					
173	North Hongland	do	1887	2.50	12					
174	Union	do	1887	2.40	12					
175	Ziegler	do	1887	10.00	43					
176	Comodore	Saguache Creek	1887	3.60	9					
177	Jays	do	1887	1.80	9					
178	Frieze No. 2	do	1887	1.00	1	18	1	30	50	
179	Giddell & Means	do	1887	2.40	1	5	1	70	150	
180	Holding No. 1	do	1887	2.70	1	15	2	60	140	
181	Mieley	do	1888	4.50	2					
182	Sheek	do	1888	1.20	2					
183	Connard	do	1888	2.40	2					
184	Farrington No. 2	do	1888	2.40	2					
Total				561.76	1,500			16,170	20,265	1887, 1; 1888, 0.80.

a These returns defective. See report for explanation of these tables.

List of ditches in District No. 27, Colorado.

No.	Name.	Stream.	Date of first use.	Decree.	Possible acreage.	Capac-ity.	1860.			Remarks.
							Days.	Per day.	Acres.	
1	La Loma	Carnero Creek	1870	20	100	2	90	1	180	
2	Madre	do	1870	21	60	9	90	1.5	270	
3	Angostura	do	1870	1.04	60	2.8	90	1	180	
4	La Isla	do	1870	1.30	40	2.8	90	1	180	
5	Biedell No. 10	La Garita Creek	1870	1.95	310	13.8	80	2	320	
6	La Vega	Carnero Creek	1870	1.52	60	2.8	60	0.5	60	
7	Wilson No. 1	Carnero and La Garita creeks.	1871	1.82	160	8	80	1.5	240	0.52 from Cranero; 1.30 from La Garita.
8	Wilson No. 2	Carnero Creek	1871	.52	60	2.8	60	0.4	48	
9	Wilson No. 3	do	1871	.52	60	5.5	60	0.4	48	
10	Biedell No. 2	La Garita Creek	1871	.78	125	13.8	80	0.8	128	
11	La Maguoties	Carnero Creek	1871	1.82	220	5.8	80			No return in 1860.
12	Bayard	do	1872	1.30	70	8	90	1	180	
13	Biedell No. 3	La Garita Creek	1872	.65	100	11	80	0.6	40	
14	do	do	1872	.65	120	5.5	80	1	160	No return in 1860.
15	Romell No. 1	do	1872	1.04	100	7	80	1	160	
16	Wilson No. 4	Carnero Creek	1872	2.00	300	7	60	2	240	
17	Green No. 1	do	1872	.65	55	0.8	70	0.5	70	
18	Manuel	La Garita Creek	1873	.78	80	0.8	90	0.6	90	
19	McLeod No. 1	do	1873	.40	40	1	70	0.6	84	
20	McLeod No. 2	do	1873	.40	40	1	70	0.6	84	
21	Negar	do	1874	1.04	110	1.1	90	0.4	120	
22	Cerro	Carnero Creek	1874	.32	110	4	70	0.4	72	
23	Middle	La Garita Creek	1874	.32	90	1	70	0.4	55	
24	Home No. 1	do	1875	1.30	130	2	70	1	140	
25	Garcia	do	1875	.52	100	1	80	1	160	
26	Biedell No. 7	La Garita Creek	1875	.78	125	8	70	0.8	130	
27	Du Bois	do	1875	1.04	110	5.5	70	1	140	
28	Biedell No. 4	do	1875	.78	125	2	60	0.5	128	
29	Stewart No. 4	do	1875	1.04	100	2	60	0.5	60	
30	White No. 1	do	1878	1.30	110	1.3	60	0.7	98	
31	McLeod No. 3	Carnero Creek	1878	1.56	135	0.7	70	1.4	196	
32	Green No. 1	do	1879	.65	70	3.6	70	0.6	84	
33	Green No. 2	do	1879	.78	65	3.6	70	0.6	84	
34	Green No. 6	do	1879	1.04	90	1.4	60	1	120	
35	Curby No. 1	La Garita Creek	1879	.78	60	1	60	1	120	
36	Curby No. 2	do	1879	.78	60	1	60	1	120	
37	Curby No. 3	do	1879	.78	60	1	60	1	120	
38	Curby No. 4	Carnero Creek	1879	.39	35	2.8	70	0.3	42	
39	Green No. 4	do	1879	.39	35	0.4	70	0.3	42	
40	Green No. 5	do	1879	.78	65	2	70	0.6	84	
41	Cassius	do	1879	.65	80	0.6	60	0.5	60	

List of ditches in District No. 35, Colorado.

[Arranged geographically down each stream. Dates of construction uncertain.]

No.	Name.	Stream.	Date of first use.	Decree, a	Capacity.	1895.			Remarks.
						Acres-foot.	Acres.	Acres-foot.	
1	Chevallie	Trinchera Creek	Before 1880		2	320	80	240	80
2	Private	do	do		1	80	20	60	20
3	Redman north	do	do		2	320	80	240	80
4	Redman south	do	do		2	320	80	240	80
5	Hughes Wohlstein	do	do		2	320	80	240	80
6	Alamos Altos	do	1889		2	320	80	240	80
7	Steward north	do	Before 1880		1.5	320	80	240	80
8	Steward south	do	About 1886		1.5	320	80	240	80
9	Jerry McCarthy	do	do		2.5	500	140	420	140
10	Meadow	do	1889		2	100	40	100	40
11	Johnny	do	1874		2	100	40	100	40
12	Home	do	1873		2.5	360	90	270	90
13	Spring	do	1884		1.5	120	30	90	30
14	Coygill McCarthy	do	1873		4	500	140	420	140
15	Farm	do	Before 1880		3	320	80	240	80
16	Cañon	do	do		4	300	90	270	90
17	Trinchera	do	1888		100	2,100	700	1,100	550
18	Overflow No. 1	do	1889		4	300	100	150	100
19	Overflow No. 2	do	1889		4	200	100	150	100
20	Ward	Sangre de Cristo Creek	Before 1880		2	100	40	120	40
21	Lamy north	do	do		2	100	40	120	40
22	Lamy south	do	do		2	100	40	120	40
23	Vigil No. 1	do	do		3	180	60	180	60
24	Vigil No. 2	do	do		1.5	240	20	60	20
25	Vigil No. 3	do	do		2	80	20	60	20
26	Vigil No. 4	do	do		1.5	80	20	60	20
27	Garland	Sangre de Cristo Creek	Before 1880		100	900	300	400	200
28	Cottonwood	do	1889		3	240	80	160	80
29	John	do	1889		3	240	80	160	80
30	Corey	do	1889		2	120	60	120	60
31	Mexican No. 1	Ute Creek	Before 1880		1	80	20	80	20
32	Mexican No. 2	do	do		1	80	20	80	20
33	Mexican No. 3	do	do		1	80	20	80	20
34	Mexican No. 4	do	do		1	80	20	80	20
35	Mexican No. 5	do	do		1	80	20	80	20
36	Wilkins No. 1	do	do		3	320	80	240	80
37	Wilkins No. 2	do	do		3	320	80	240	80
38	Wilkins No. 3	do	do		3	320	80	240	80

Has never carried over 40 second-feet.

Has never carried over 50 second-feet.

DISTRIBUTION OF WATERS OF THE RIO GRANDE. 1883

39	Wilkins No. 4	do	do	3	320	90	240	80
40	Wilkins No. 5	do	do	3	320	80	240	80
41	Wilkins No. 6	do	do	3	320	80	240	80
42	Ranch No. 1	do	do	3	320	80	240	80
43	Ranch No. 2	do	do	3	320	80	240	80
44	Ranch No. 3	do	do	4	240	80	100	80
45	Etter	do	1855	15	940	320	640	320
46	Thompson	do	Before 1880	9	320	160	240	160
47	McMillen	do	1874	7	240	160	100	160
48	Arroyo	do	Before 1880					
Total				346	15,020	4,430	10,410	4,180

" This district has not been adjudicated.

List of ditches in District No. 1, New Mexico—San Antonio.

Num- ber of ditches.	Num- ber on stream.	Name.	Stream.	When built.	Approximate location of head.	Capac- ity.	Total capac- ity.	Acres irri- gated.	Acre-feet of water used.			Remarks.
									1894.	1895.	1896.	
1	1	Private	Los Pinos Creek	Before 1880	Sec. 32, T. 32 N., R. 7 E.	Sec. fl.	Sec. fl.	60	240	240	240	
1	2	do	do	do	Sec. 34, T. 32 N., R. 7 E.	2	2	60	240	240	240	
1	3	do	do	do	Sec. 36, T. 32 N., R. 7 E.	2	2	60	240	240	240	
1	4	do	do	do	Sec. 6, T. 33 N., R. 7 E.	2	2	60	240	240	240	
1, 2, 3, 4	5	Small private	San Antonio Creek	do	Sec. 11, T. 30 N., R. 7 E.	5	5	200	800	800	800	
1	5	Upper San Antonio	San Antonio Creek	do	do	5	5	200	800	800	800	
1	6	Lower San Antonio	San Antonio Creek	do	Sec. 7, T. 30 N., R. 8 E.	9	9	600	2,400	2,400	1,800	
1	7	Private	North side San Antonio Creek	do	Sec. 4, T. 30 N., R. 8 E.	2	2	30	120	120	90	
11		Total					32	1,270	5,040	5,080	4,450	

a Each.

DISTRIBUTION OF WATERS OF THE RIO GRANDE. 1501

List of ditches in District No. 2, New Mexico, Chama.

Number of ditches.	Number on stream.	Name.	Stream.	When built.	Approximate location of head.	Capacity.	Total irrigated.	Acre-feet of water used.			Remarks.
								1894.	1895.	1896.	
3	1, 2, 3	Private	Little Chama River.	1892	Sec. 31, T. 22 N., R. 3 E.	100 feet each.	Second feet.	1,500	1,500	.....	No water in 1896.
2	4, 5	do.	do.	1890	Sec. 10, T. 31 N., R. 3 E.	a 1	8	450	450	.....	Do.
2	1	Botter's	Chama River	1889	Sec. 5, T. 30 N., R. 4 E.	5	5	200	200	200	Small stream.
1	2	Begg's	do.	1889	Sec. 9, T. 30 N., R. 4 E.	2	12	120	120	120	
1	1	Riverside	do.	1890	Sec. 17, T. 30 N., R. 4 E.	a 4	12	140	500	500	
3	3, 4, 5	Burns	Canones Creek	1890	Sec. 17, T. 30 N., R. 4 E.	24	36	1,230	1,230	820	
1	6	Seth's Mill	Chama River	1878	Sec. 20, T. 30 N., R. 4 E.	26	36	610	2,440	1,830	
1	1	Los Brazos	North side Los Brazos.	1861	Sec. 23, T. 30 N., R. 4 E.	15	15	2,400	2,400	1,800	
1	1	Enseñada	South side Los Brazos.	1861	Sec. 23, T. 30 N., R. 4 E.	48	48	5,000	6,000	4,500	Acreage has increased from 1,000 acres in 1893.
1	2	Parkview	do.	1861	Sec. 24, T. 30 N., R. 4 E.	60	60	10,000	10,000	7,500	Acreage has increased from 1,000 acres in 1893.
1	3	Spring	Springs along Chama River.	1870	Sec. 32, T. 30 N., R. 4 E.	5	5	500	500	500	
1	8	Puente Bottoms	West side Chama River.	1867	Sec. 5, T. 29 N., R. 4 E.	8	8	1,200	1,200	900	
1	9	Brook's	do.	1891	Sec. 34, T. 28 N., R. 2 E.	a 6	18	1,500	1,500	300	But 150 acres watered in 1896.
3	10, 11, 12	Private	Nutritas Creek	1861	Sec. 15, T. 29 N., R. 5 E.	36	36	1,000	3,000	2,000	
1	1	Private	do.	1870	Sec. 20 to 22, T. 29 N., R. 5 E.	a 2	15	100	300	300	
4	2, 3, 1, 5	Private above Plaza	Nutritas Creek	1860 to 1865	Sec. 1, 2, 3, T. 27 N., R. 4 E.	a 1.5	13	1,200	1,200	1,000	
13	11 to 23	Private below Plaza	do.	1860 to 1865	Sec. 9, 16, 17, T. 27 N., R. 4 E.	a 1.5	19	1,280	1,280	320	Crop a failure in 1896.
1	1	Cebolla	Cebolla Creek	1877	Sec. 24, T. 27 N., R. 4 E.	a 9	18	450	900	670	
1	1	Private	do.	1877	Sec. 36, T. 27 N., R. 4 E.	a 9	9	250	500	380	
1	3	Genega	Genega Creek	1877	Sec. 33, 34, 35, T. 27 N., R. 4 E.	a 2	16	300	600	600	
1	4 to 11	Private	Cebolla Creek	1877 to 1879	Sec. 31, T. 27 N., R. 4 E.	a 1.5	3	50	150	150	Springs.
8	12, 13	West Canjilon	Genega Creek	1870	Sec. 3, T. 28 N., R. 5 E.	16	16	1,800	1,800	1,350	
1	1	Middle Canjilon	do.	1870	Sec. 9, T. 28 N., R. 5 E.	20	20	1,100	2,200	1,100	
1	2	East Canjilon	Branch of Canjilon Creek.	1870	Sec. 17, T. 26 N., R. 5 E.	8	8	400	800	600	
1	3	Lower Canjilon	Springs along Canjilon Creek.	1873	Sec. 11, T. 25 N., R. 4 E.	4	4	100	200	200	
1	4	Private	El Rito Creek above mill.	Before 1860	Sec. 11, T. 26 N., R. 6 E.	a 2	18	1,300	1,300	1,020	El Rito drainage is always short of water.
9	1 to 9	Private	do.	Before 1860	Sec. 11, T. 26 N., R. 6 E.	a 2	18	1,300	1,300	1,020	

a Each.

List of ditches in District No. 2, New Mexico, Chama—Continued.

Number of ditches.	Number on stream.	Name.	Stream.	When built.	Approximate location of head.	Capacity.	Total capacity.	Acres irrigated.	Acres-foot of water used.			Remarks.
									1894.	1895.	1896.	
22	10, 11	Mill	El Rito Creek below mill.	Before 1899.	Sec. 2, 11, T. 25 N., R. 6 E.	100 feet each. a 4	Second feet. 8	600	1,200	1,000	800	
1	12	Acequia Madre de El Rito.	El Rito Creek.	1730.	Sec. 18, T. 25 N., R. 7 E.	36	30	1,000	3,200	2,700	2,400	
1	13	Lower El Rito.	do.	About 1800	Sec. 3, T. 24 N., R. 7 E.	24	24	900	1,800	1,000	1,350	
4	14, 15, 16, 17	East El Rito.	do.	do.	Sec. 3, T. 24 N., R. 7 E.	a 6	24	650	1,200	1,160	970	
22	1, 2	Upper Vallecito	Vallecito Creek.	Before 1899	Sec. 14, T. 27 N., R. 7 E.	a 8	16	400	1,600	1,000	1,000	Caliente drainage always furnishes abundant water.
21	3, 4	Lower Vallecito	do.	do.	Sec. 2, T. 26 N., R. 7 E.	a 20	60	900	3,000	3,000	3,000	
22	5	Trellaire Vallecito.	do.	do.	Sec. 34, T. 26 N., R. 8 E.	a 8	8	250	1,000	1,000	1,000	
1	6, 7	Alguin	do.	do.	Sec. 3, T. 27 N., R. 8 E.	a 3	6	160	640	640	640	
1	8	Ancones	do.	do.	Sec. 10, T. 25 N., R. 8 E.	18	18	480	1,920	1,920	1,920	
1	9	Llanito	do.	do.	Sec. 14, T. 25 N., R. 8 E.	8	8	200	800	800	800	
1	10	West La Cueva	do.	do.	Sec. 24, T. 25 N., R. 8 E.	12	12	300	1,200	1,200	1,200	
1	11	East La Cueva	do.	do.	Sec. 24, T. 25 N., R. 8 E.	3	3	60	160	160	160	
1	12	Privato	Ojo Caliente River	do.	Sec. 12, T. 24 N., R. 8 E.	4	4	60	240	240	240	
1	13	Garilan	do.	do.	Sec. 13, T. 24 N., R. 8 E.	a 4	4	100	400	400	400	
14, 15	14, 15	Sanietta	do.	do.	Sec. 34, T. 26 N., R. 9 E.	a 4	4	100	400	400	400	
16, 17	16, 17	Las Zorras	Petaca Creek	do.	Sec. 9, T. 25 N., R. 9 E.	a 2	4	100	400	400	400	
1	18	Las Tusas	do.	do.	Sec. 8, T. 28 N., R. 8 E.	4	4	100	400	400	400	
1	2, 3	Las Tablas	East Fork Petaca Creek.	do.	Sec. 35, T. 28 N., R. 8 E.	a 3	6	160	640	640	640	
1	4	Private	Petaca Creek	do.	Sec. 14, T. 27 N., R. 8 E.	2	2	60	240	240	240	
1	5, 6	Plaza Petaca	do.	do.	Sec. 30, T. 27 N., R. 9 E.	a 8	16	400	1,600	1,000	1,000	
1	1	Capulin	Gallinas River	do.	Sec. 23, T. 23 N., R. 1 E.	5	5	200	400	300	300	Water supply poor.
1	1, 2	Chavez	do.	do.	Sec. 14, T. 24 N., R. 1 E.	5	5	200	300	300	300	Do.
1	2	Plaza Coyote	Rio Puerco	do.	Sec. 18, T. 22 N., R. 3 E.	a 30	60	1,500	3,000	2,250	1,500	Water supply always short.
1	3	Private	do.	do.	Sec. 12, T. 23 N., R. 3 E.	4	4	100	200	150	100	Do.
1	2	Plaza Vallecito	Vallecito Creek.	do.	Sec. 12, T. 22 N., R. 5 E.	a 5	10	300	600	600	450	Water supply sometimes short.
1	13	Private	Chama River	do.	Sec. 14, T. 23 N., R. 5 E.	10	10	100	400	400	400	
1	14	do.	do.	do.	Sec. 24, T. 23 N., R. 5 E.	6	6	80	320	320	320	
1	15	Plaza Colorado	do.	1754	Sec. 19, T. 23 N., R. 6 E.	15	15	300	1,200	1,200	900	
1	16	Plaza Abiquiu	do.	1730	Sec. 30, T. 23 N., R. 6 E.	28	28	560	2,240	2,240	1,680	
1	17	Leboto, north	do.	1754	Sec. 22, T. 23 N., R. 6 E.	24	24	480	1,920	1,920	1,440	
1	18	Leboto, south	do.	1754	Sec. 22, T. 23 N., R. 6 E.	8	8	160	640	640	480	
1	19	Placito, Martinis	do.	Before 1754.	Sec. 19, T. 23 N., R. 7 E.	16	16	320	1,280	1,280	960	
1	20	Tierra Azul	do.	do.	Sec. 36, T. 23 N., R. 7 E.	6	6	120	480	480	360	

DISTRIBUTION OF WATERS OF THE RIO GRANDE.

189

List of ditches in District No. 3, New Mexico—Cerro Mesa.

a Each.

Number of ditches.	Number on stream.	Name.	Stream.	When built.	Approximate location of head.	Capacity.	Total capacity.	Acres irrigated.	Acro feet of water used.			Remarks.
									1894.	1895.	1896.	
1	1	La Vega	do	do	Sec. 33, T. 23 N., R. 7 E.	22	22	470	1,840	1,840	1,350	
1	1	Private	do	do	Sec. 33, T. 23 N., R. 7 E.	5	5	100	400	400	500	
1	1	La Cuchilla	do	Before 1890	Sec. 25, T. 22 N., R. 7 E.	25	25	500	2,000	2,000	1,500	
128		Total				1,010	27,520	80,380	84,450	66,870		
1	1	Private	Costilla Creek	1873	T. 22 N., R. 14 E.	12	24	650	2,000	2,000	2,000	
1	1	South Costilla Plaza	do	1876	T. 22 N., R. 13 E.	12	12	300	1,200	1,200	1,200	
1	1	Cerro	Ritos del Lotir, En Medio, Primo Fo and Joroso.	1882	T. 20 N., R. 13 E.	12	12	2,000	2,000	2,000	1,000	
1	1	Private	Rito del Lotir	1886	T. 20 N., R. 13 E.	8	8	450	450	450	250	
1	1	do	Rito Joroso	1886	T. 20 N., R. 13 E.	3	3	50	50	50	50	
1	1	do	Rito En Medio	1886	T. 20 N., R. 13 E.	8	8	120	120	120	60	
1	1	do	Rito Primero	1886	T. 20 N., R. 13 E.	8	8	100	100	100	50	
1	1	Llano	Colores Creek	1891	Sec. 27, T. 20 N., R. 13 E.	20	20	2,000	6,000	6,000	6,000	
1	1	Colorado Plaza	do	About 1842	Sec. 28, T. 20 N., R. 13 E.	8	8	400	1,000	1,000	1,000	
1	1	Red River	Red River and Co-greito Creek.	do	Sec. 35, T. 20 N., R. 13 E.	15	15	800	2,800	2,800	2,800	
1	1	Private	Lower Red River	1851	Sec. 33, T. 20 N., R. 13 E.	2	2	50	200	200	200	
1	1	Cebolla	do	1851	Sec. 32, T. 20 N., R. 13 E.	6	6	250	800	800	800	
1	1	South San Cristobal	Lerna Canon	Before 1840	Sec. 7, T. 28 N., R. 13 E.	2	2	40	100	80	60	
1	1	North San Cristobal	San Cristobal Creek	do	Sec. 24, T. 28 N., R. 13 E.	8	8	400	1,200	1,200	800	
1	1	Lobo (see District No. 4 for Ditch No. 1 from Rio Hondo)	do	do	Sec. 30, T. 28 N., R. 13 E.	3	3	150	450	450	300	
1	1	Private	Lobo Creek	1884	T. 27 N., R. 12 E.	6	6	200	300	300	200	
1	1	South Plaza	Rio Hondo	Before 1830	Sec. 27, T. 27 N., R. 13 E.	3	3	75	300	300	300	
1	1	North Plaza	do	do	Sec. 27, T. 27 N., R. 13 E.	10	10	320	1,280	1,280	1,280	
1	1	Private	do	do	Sec. 31, T. 27 N., R. 13 E.	3	3	75	300	300	300	
1	1	Rio Hondo, north	do	do	Sec. 30, T. 27 N., R. 12 E.	8	8	300	1,200	1,200	900	
1	1	Rio Hondo, south	do	do	Sec. 30, T. 27 N., R. 12 E.	15	15	600	2,400	1,800	1,800	
28		Total				194	194	9,280	25,450	24,530	22,540	

a Each.

Ditches in District No. 4, New Mexico—Taos Mesa.

Number of ditches	Number on stream.	Name.	Stream.	When built.	Approximate location of head.	Capac- ity.	Total ca- pacity.	Acres irri- gated.			Acres of water used.			Remarks.
								1894.	1895.	1896.				
1	1	Mesa	Rio Hondo	1890	Sec. 27, T. 27 N., R. 13 E.	Sec. feet. 30	Sec. feet. 30	1,500	4,500	4,500	4,500			
1	1	Arroyo Seco	Lucero and Sero creeks.	Before 1890	Sec. 11, T. 26 N., R. 13 E.	12	12	1,500	2,400	2,400	1,500			
1	2	Las Colono	Seco Creek	1890	Sec. 7, T. 26 N., R. 13 E.	4	4	300	450	450	150			
1	2	East Lucero	Lucero Creek	Pueblo (very old).	Sec. 16, T. 26 N., R. 13 E.	3	3	120	240	240	180			
1	3	West Lucero	do	About 1890	Sec. 16, T. 26 N., R. 13 E.	4	4	160	320	320	240			
2	4.5	Middle Lucero	do	Pueblo (very old).	Sec. 25, T. 26 N., R. 13 E.	α3	α3	240	480	480	300			
1	6	Mexican	do	About 1890	Sec. 3, T. 25 N., R. 13 E.	3	3	120	240	240	180			
8	7 to 14	Indian	Pueblo Creek, above Pueblo.	Pueblo (very old).	Sec. 3, T. 25 N., R. 13 E.	α3	24	960	1,920	1,920	1,440			
1	15	do	Pueblo Creek, below Pueblo.	do	Sec. 3, T. 25 N., R. 13 E.	3	3	120	240	240	180			
1	16	Main	Pueblo	Before 1890	Sec. 9, T. 25 N., R. 13 E.	12	12	720	1,440	1,440	1,080			
10	17 to 26	Private	Pueblo	do	Sec. 9, T. 25 N., R. 12 and 13 E., T. 25 N., R. 13 and 14 E.	α5	α5	3,000	4,500	4,500	3,000			
18	1 to 18	Private, up cañon	Toos Creek	About 1890	Sec. 1, T. 25 N., R. 13 E.	α2	36	540	2,160	2,160	2,160			
22	19, 20 21, 22	Fernandez de Taos	do	About 1890	Sec. 22, T. 25 N., R. 13 E.	α15	30	1,500	4,500	4,500	2,250			
22		Private	Springs in Taos Creek.	Before 1890	Sec. 18, T. 25 N., R. 13 E.	α4	8	400	800	800	800			
1	1	La Acquia del Llano	Ranchos de Taos Creek.	do	Sec. 18, T. 24 N., R. 13 E.	15	15	800	2,400	2,400	1,000			
1	2	La Acquia del Rio	do	do	Sec. 18, T. 24 N., R. 13 E.	30	30	1,800	5,400	5,400	3,000			
1	3	Del Medios del Rio	do	do	Sec. 12, T. 24 N., R. 12 E.	4	4	200	600	600	400			
1	4	Torres	do	do	Sec. 12, T. 24 N., R. 12 E.	4	4	200	600	600	400			
1	5	Hart	do	do	Sec. 30, T. 25 N., R. 12 E.	14	14	800	2,400	2,400	1,000			
4	6, 7, 8, 9	Private	do	do	Sec. 30, T. 25 N., R. 12 E.	α2	8	120	300	300	240			
1	10	North Chiquito	Rio Chiquito	do	Sec. 7, T. 24 N., R. 13 E.	40	40	3,000	9,000	9,000	6,000			
1	11	South Chiquito	do	do	Sec. 7, T. 24 N., R. 13 E.	5	5	250	750	750	500			
61		Total					346	18,050	45,700	45,700	32,000			

α Each.

DISTRIBUTION OF WATERS OF THE RIO GRANDE.

List of ditches in District No. 5, New Mexico—Embudo Creek.

Number of ditches.	Number on stream.	Name.	Stream.	When built.	Approximate location of head.	Capacity.	Total capacity.	Acres irrigated.	Acre feet of water used.			Remarks.
									1894	1895	1896	
1	1	Mora.....	Head of Picuris Creek.	1880.....	T. 22 N., R. 13 E.....	Sec. 16	Sec. 16	900	2,880	2,880	2,880	Diverts water to Pecos drainage.
1	2	Mora Enlargement.	do	1890.....	T. 22 N., R. 13 E.....	16	16	900	2,880	2,880	2,880	Do.
7	3 to 9	Private	Canyon of Picuris Creek.	Before 1890	T. 22 N., R. 12 and 13 E.....	a 2	14	140	560	560	560	
1	10	South Rio Pueblo Plaza.	Picuris Creek.	Before 1840	Sec. 8, T. 22 N., R. 13 E.....	12	12	480	1,200	1,200	900	
1	11	North Rio Pueblo Plaza.	do	do	Sec. 6, T. 22 N., R. 13 E.....	6	6	240	600	600	480	
1	12	Private	South side Picuris Creek.	do	Sec. 1, T. 22 N., R. 12 E.....	6	6	240	600	600	480	
1	13	do	North side Picuris Creek.	do	Sec. 1, T. 22 N., R. 12 E.....	6	6	240	600	600	480	
1	14	Picuris Pueblo.	do	Pueblo, very old.	Sec. 26, T. 23 N., R. 12 E.....	12	12	480	1,200	1,200	900	
1	15	do	South side Picuris Creek.	do	Sec. 26, T. 23 N., R. 12 E.....	8	8	300	750	750	600	
1	1	Chamizal	Penasco Creek.	About 1815	Sec. 22, T. 22 N., R. 12 E.....	30	30	1,200	3,600	3,600	3,600	Carried over a low divide to a side valley.
1	2	Llano San Juan	do	do	Sec. 21, T. 22 N., R. 12 E.....	20	20	700	2,100	2,100	2,100	
1	3	Llano de la Teguia	do	do	Sec. 21, T. 22 N., R. 12 E.....	10	10	350	1,050	1,050	1,050	
1	4	Santa Barbara	do	do	Sec. 21, T. 22 N., R. 12 E.....	10	10	350	1,050	1,050	1,050	
1	5	Penasco Plaza	do	do	Sec. 3, T. 22 N., R. 12 E.....	5	5	180	450	450	540	
1	6, 7, 8, 9	Private	do	do	Sec. 3, T. 22 N., R. 12 E.....	a 5	20	500	1,500	1,500	1,500	
2	1, 2	Las Trampas Plaza	do	do	T. 22 N., R. 12 E.....	5	10	400	1,200	1,200	800	
1	3	Ojo Zarco	do	do	T. 22 N., R. 11 E.....	6	6	400	800	800	600	Carried over a divide to Ojo Zarco Valley.
1	1	Upper Embudo	Embudo Creek	do	Sec. 26, T. 23 N., R. 10 E.....	6	6	240	620	620	620	
1	2	Middle Embudo	do	do	Sec. 25, T. 23 N., R. 10 E.....	4	4	140	420	420	420	
1	3	Lower Embudo	do	do	Sec. 24, T. 23 N., R. 10 E.....	3	3	100	300	300	300	
1	1	North Embudo	do	do	Sec. 24, T. 23 N., R. 10 E.....	10	10	350	1,050	1,050	1,050	
1	3	La Junta	do	do	Sec. 20, T. 23 N., R. 10 E.....	6	6	200	600	600	600	
32		Total					226	9,120	26,110	26,110	24,520	

a Each.

List of ditches in District No. 6, New Mexico—Santa Cruz.

Num- ber of ditches	Num- ber of on stream.	Name.	Stream.	When built.	Approximate location of head.	Capac- ity.	Total capac- ity.	Acres irri- gated.	Acres-foot of water used.			Remarks.
									1894.	1895.	1896.	
1	1	Las Truches	Las Truches Creek	Before 1860	T. 21 N., R. 11 E.	Sec. 11.	Sec. 11.	200	600	600	400	
2	1, 2	Private	Santa Cruz River	do	T. 20 N., R. 9 E.	a 4	8	200	800	800	800	
2	3, 4	Chimayo	do	do	T. 20 N., R. 9 E.	12	24	1,000	3,000	3,000	3,000	
1	1	Bishop	Tusque Creek	do	T. 18 N., R. 10 E.	6	6	200	600	600	600	
6	2 to 7	Private	do	do	T. 18 N., R. 9 E.	a 2	12	400	800	800	600	
2	8, 9	Tusque Pueblo	do	Pueblo very old.	Sec. 15, T. 18 N., R. 9 E.	a 3	10	300	600	600	450	
2	10, 11	Private	do	Old.	T. 19 N., R. 9 E.	a 3	6	100	200	200	150	
6	12 to 17	Cuyanaque	do	do	T. 19 N., R. 9 E.	a 2	12	500	1,000	1,000	750	Partially from springs.
3	18, 19, 20	Private	do	do	Sec. 18, T. 19 N., R. 9 E.	a 2	6	100	150	150	100	
4	1, 2, 3, 4	do	Namblé Creek	do	Sec. 18, T. 19 N., R. 9 E.	a 2	8	100	300	300	300	
1	5	Namblé Pueblo	do	Pueblo very old.	Sec. 14, T. 19 N., R. 9 E.	6	6	200	600	600	400	
4	6, 7, 8, 9	Namblé Pueblo farms	do	do	Sec. 10, T. 19 N., R. 9 E.	a 2	8	100	300	300	200	
1	10	Main Pojuaque Pueblo.	Pojuaque (Namblé) Creek.	do	Sec. 10, T. 19 N., R. 9 E.	10	10	600	1,500	1,500	900	
1	11	South Pojuaque Pueblo.	do	do	Sec. 9, T. 19 N., R. 9 E.	6	6	300	900	900	540	
1	12	Lower Pojuaque Pueblo.	do	do	Sec. 8, T. 19 N., R. 9 E.	4	4	240	600	600	360	
6	13 to 18	Private	do	Old.	T. 19 N., R. 8 E.	a 4	24	1,200	1,800	1,800	900	
43		Total					156	5,800	13,750	13,750	10,450	

a Each.

DISTRIBUTION OF WATERS OF THE RIO GRANDE.

List of ditches in District No. 7, New Mexico—Santa Fe.

Num- ber of ditches.	Number of stream.	Name.	Stream.	When built.	Approximate location of head.	Capac- ity.	Total capacity.	Acres irri- gated.	Acre-feet of water used.		
									1904.	1905.	1906.
1	1	Private, in cañon	Santa Fe Creek	Probably before 1800	T. 17 N., R. 10 E.	Sec. 1, foot.	100	100	340	340	340
2	2, 3	do	do	do	T. 17 N., R. 10 E.	2	2	2	250	250	250
3	4, 5	do	do	do	T. 17 N., R. 10 E.	2	2	2	250	250	250
4	6	Private, at reservoir	North side Santa Fe Creek.	do	T. 17 N., R. 10 E.	2	2	2	160	160	125
5	7	do	South side Santa Fe Creek.	do	Sec. 20, T. 17 N., R. 10 E.	3	3	3	240	240	190
6	8	do	North side Santa Fe Creek.	do	Sec. 20, T. 17 N., R. 10 E.	2	2	2	100	100	125
7	9	do	South side Santa Fe Creek.	do	Sec. 20, T. 17 N., R. 10 E.	2	2	2	100	100	125
8	10	do	North side Santa Fe Creek.	do	Sec. 19, T. 17 N., R. 10 E.	1	1	1	50	80	60
9	11	Acquila Madre	South side Santa Fe Creek.	1890	Sec. 19, T. 17 N., R. 10 E.	14	14	900	1,440	1,440	1,025
10	12	Private	North side Santa Fe Creek.	Probably before 1800	Sec. 19, T. 17 N., R. 10 E.	3	3	3	120	240	190
11	13	do	South side Santa Fe Creek.	do	Sec. 19, T. 17 N., R. 10 E.	2	2	2	100	160	125
12	14, 15	do	North and south sides Santa Fe Creek.	do	Sec. 19, T. 17 N., R. 10 E.	2	2	2	200	320	250
13	16	do	North side Santa Fe Creek.	do	Sec. 24, T. 17 N., R. 9 E.	2	2	2	100	160	125
14	17	do	South side Santa Fe Creek.	do	Sec. 24, T. 17 N., R. 9 E.	3	3	3	150	240	190
15	18, 19	do	North side Santa Fe Creek.	do	Sec. 24, T. 17 N., R. 9 E.	2	2	2	200	320	250
16	20	do	South side Santa Fe Creek.	do	Sec. 24, T. 17 N., R. 9 E.	3	3	3	150	240	190
17	21, 22	do	North side Santa Fe Creek.	do	Sec. 24, T. 17 N., R. 9 E.	2	2	2	200	320	250
18	23	Upper Agua Fria	South side Santa Fe Creek.	do	Sec. 26, T. 17 N., R. 9 E.	8	8	400	640	640	500
19	24, 25, 26	Private	North side Santa Fe Creek.	do	Sec. 27, T. 17 N., R. 9 E.	2	2	2	100	160	125
20	27, 28	do	South side Santa Fe Creek.	do	Sec. 27, T. 17 N., R. 9 E.	6	6	300	480	480	375
21	29	Lower Agua Fria	South side Santa Fe Creek.	do	Sec. 22, T. 17 N., R. 9 E.	1	1	50	80	80	60
22	30	Private	do	do	Sec. 31, T. 17 N., R. 9 E.	1	1	50	80	80	60

a Each.

List of ditches in District No. 7, New Mexico—Santa Fe—Continued.

Num- ber of ditches.	Num- ber on stream.	Name.	Stream.	When built.	Approximate location of head.	Capac- ity.	Total capacity.	Acres irri- gated.	Acre-feet of water used.		
									1904.	1905.	1906.
1	31	Private	South side Santa Fe Creek.	Probably before 1800.	Sec. 31, T. 17 N., R. 9 E.	Sec. feet, 4	4	200	320	320	250
1	32	do	North side Santa Fe Creek.	do	Sec. 6, T. 16 N., R. 9 E.	2	2	100	100	100	125
1	33	Cieneguilla	Springs along Santa Fe Creek.	Old	Sec. 30, T. 16 N., R. 8 E.	1	1	40	80	80	80
2	34, 35	Golandrina	Springs along Golan- drina Creek.	do	Sec. 33, T. 16 N., R. 8 E.	a 2	4	100	320	320	330
1	36	Private	do	do	Sec. 33, T. 16 N., R. 8 E.	2	2	100	200	200	200
1	37	do	do	do	Sec. 32, T. 16 N., R. 8 E.	3	3	150	240	240	300
1	38	do	Golandrina Creek	do	Sec. 6, T. 15 N., R. 8 E.	2	2	50	100	100	100
1	39	Upper Bonanza	Alamo Wash	do	Sec. 8, T. 15 N., R. 8 E.	2	2	150	240	240	150
2	40, 41	Middle Bonanza	do	do	Sec. 8, T. 15 N., R. 8 E.	a 2	4	300	600	600	300
1	42	Lower Bonanza	Springs in Alamo Wash.	do	Sec. 18, T. 15 N., R. 8 E.	2	2	150	240	240	150
1	43	Private	Santa Fe Creek	do	Sec. 2, T. 15 N., R. 7 E.	1	1	20	60	60	60
1	44	La Bajada	do	do	Sec. 7, T. 15 N., R. 7 E.	10	10	300	900	900	600
44		Total					117	5,920	10,560	10,560	8,940

a Each.

NOTE.—The acreage watered from Santa Fe Creek is said to be about the same now as for 18 years past. If there is any change the area has decreased.

List of ditches in District No. 8, New Mexico—Galisteo.

Num- ber of ditches.	Number on stream.	Name.	Stream.	When built.	Approximate location of head.	Capac- ity.	Total ca- pacity.	Acres irri- gated.	Acre-feet of water used.			Remarks.
									1894.	1895.	1896.	
6	1 to 6	Private	Galisteo Creek	Old	T. 15 N., R. 10 E.	Sec. 2	Sec. 12	300	900	900	900	
2	7, 8	Colorado Plaza	do	do	Sec. 17, T. 14 N., R. 10 E.	a 2	4	100	200	200	150	
1	9	San Cristobal	Arroyo San Cristobal	do	Sec. 28, T. 14 N., R. 10 E.	a 2	2	100	150	150	100	
1	10, 11	Galisteo Plaza	Galisteo Creek	do	Sec. 25, T. 14 N., R. 9 E.	a 5	10	400	800	800	400	
1	12	Ortiz	do	do	Sec. 5, T. 13 N., R. 9 E.	a 2	2	60	90	90	60	
1	13, 14	Cerrillas	do	do	Sec. 20, T. 14 N., R. 8 E.	a 2	4	100	200	200	200	Springs.
1	1	Tijon	Tijon Arroyo	do	T. 13 N., R. 6 E.	a 2	2	80	160	160	130	Do.
1	1	Puertos Plaza	Puertos Arroyo	do	T. 13 N., R. 6 E.	4	4	200	300	300	200	Do.
1	1, 2	San Antonio	Tijeras Canon	do	T. 11 N., R. 5 E.	a 4	8	400	800	800	600	
3	3, 4, 5	Private	do	do	T. 10 N., R. 5 E.	a 2	6	200	300	300	200	
2	6, 7	San Antonio	do	do	T. 10 N., R. 5 E.	a 3	6	300	450	450	300	
23		Total					60	2,240	4,350	4,350	2,950	

a Each.

List of ditches in District No. 2, New Mexico—Jemez.

Num- ber of ditches.	Number on stream.	Name.	Stream.	When built.	Approximate location of head.	Capac- ity.	Total capacity.	Acres irri- gated.	Acre-feet of water used.		
									1894.	1895.	1896.
1	1	Guadalupe Main	West side, Guadalupe Creek.	Before 1800.	Sec. 34, T. 18 N., R. 1 E.	Sec. flt. 16	Sec. flt. 16	800	3,200	3,200	2,400
3	2, 3, 4	Private	East side, Guadalupe Creek.	do	T. 17 N., R. 2 E.	a 4	12	520	2,080	2,080	1,500
3	1, 2, 3	do	Cebolla Creek.	1884	Secs. 3, 10, T. 19 N., R. 2 E.	a 2	6	200	800	800	800
2	1, 2	Private	do	1882	Secs. 11-12, T. 18 N., R. 3 E.	a 2	4	100	300	250	200
1	1	Private	Jemez River	1898	Sec. 17, T. 19 N., R. 3 E.	2	2	80	320	320	320
1	2	do	do	Before 1874	Sec. 12, T. 18 N., R. 2 E.	a 2	12	50	200	200	200
4	3 to 8	Armadillo Valley	do	Before 1896	Secs. 23, 27, T. 18 N., R. 2 E.	a 2	12	640	2,560	2,560	2,500
2	9, 10	Private	West side, Jemez River.	Before 1890	Sec. 28, T. 17 N., R. 2 E.	a 2	4	100	400	400	400
1	11	Upper Jemez Pueblo	do	Pueblo; very old	Sec. 32, T. 17 N., R. 2 E.	20	20	1,200	4,800	4,800	3,600
1	12	do	East side, Jemez River.	do	Sec. 32, T. 17 N., R. 2 E.	12	12	500	2,000	2,000	1,500
1	13	Lower Jemez Pueblo	do	do	Sec. 17, T. 16 N., R. 2 E.	12	12	400	1,600	1,600	1,300
1	1, 2	Private	Vallecito Viejo	Before 1800	Sec. 12, T. 16 N., R. 2 E.	a 4	8	300	1,200	1,200	1,000
2	14, 15	San Ysidro	West side, Jemez River.	do	Sec. 20, T. 16 N., R. 2 E.	a 6	12	600	1,500	1,500	900
1	16	Zia Pueblo	do	Pueblo; very old	Sec. 21, T. 15 N., R. 2 E.	9	9	300	450	300	150
27		Total					131	5,790	20,810	20,210	16,240

a Each.

DISTRIBUTION OF WATERS OF THE RIO GRANDE. 2102

List of ditches in District No. 10, New Mexico, Puerto.

Num. of ditches.	Number of stream.	Name.	Stream.	When built.	Approximate location of head.	Capac- ity.	Total capac- ity.	Acres irri- gated.			Remarks.
								1864.	1865.	1896.	
1	1	San Jose	San Jose Creek	1872	Sec. 15, T. 22 N., R. 1 W.	1	Sec. 15	10	20	20	
1	1	La Juna	La Juna Creek	1872	Sec. 6, T. 21 N., R. 1 W.	8	8	600	900	600	
2	1, 2	Los Pinos	Los Pinos Creek	1872	Sec. 4, T. 21 N., R. 1 W.	a 2	4	150	150	100	
2	1, 2	Cuba-east and west.	Rio Puerto.	1872	Sec. 1, T. 21 N., R. 1 W.	a 12	24	1,000	1,500	1,000	
2	1, 2	Copper City	Rito La Leche	1872	Sec. 22, T. 21 N., R. 1 W.	a 2	4	250	250	200	
5	1 to 5	Private	Rito del Nocimiento	1872	Sec. 26, T. 21 N., R. 1 W.	a 2	10	350	700	520	
1	1	Private	Rio Puerto	1872	Sec. 32, T. 21 N., R. 1 W.	3	3	180	270	180	
1	1	do	do	1872	Sec. 32, T. 21 N., R. 1 W.	6	6	350	450	350	
1	1	La Ventana.	do	1872	Sec. 31, T. 19 N., R. 2 W.	4	4	200	200	200	
1	5	La Tijera.	do	1872	Sec. 23, T. 19 N., R. 2 W.	6	6	200	400	200	
7, 8	7, 8	Tabazon	do	1872	Sec. 12, T. 16 N., R. 2 W.	a 3	6	200	200	200	
1	9	Private	do	1872	Sec. 12, T. 16 N., R. 2 W.	4	4	170	170	150	
1	10	Santa Clara.	do	1872	Sec. 24, T. 15 N., R. 3 W.	6	6	250	250	200	
1	11	Agua Gloriosa.	do	1872	Sec. 25, T. 15 N., R. 3 W.	20	20	300	300	220	
1	12	Acquia, Guadalupe.	do	1872	Sec. 25, T. 15 N., R. 3 W.	9	9	100	100	80	
1	13	Comunio de Salazar.	do	1872	Sec. 35, T. 15 N., R. 3 W.	26	26	500	500	380	
1	14	Acquia del Chino.	do	1872	Sec. 35, T. 15 N., R. 3 W.	42	42	600	450	300	
1	15	Private	do	Old	Sec. 31, T. 7 N., R. 2 W.	4	4	150	120	70	
2	1, 2	Juan Tufuya Plaza	Springs	Before 1800	T. 13 N., R. 4 W.	a 4	8	200	300	300	Springs.
1	1	Mokino.	East Fork Cebolletta Creek	do	T. 11 N., R. 5 W.	2	2	50	100	70	
2	2, 3	Cebolletta	Middle Fork Cebolletta Creek	do	T. 11 N., R. 5 W.	a 3	6	250	750	750	Do.
3	4, 5, 6	Cebolletta	West Fork Cebolletta Creek	do	T. 11 N., R. 5 W.	a 2	6	400	600	400	
4	1 to 4	Pajuno	Pajuno Creek	Before 1870	T. 11 N., R. 5 W.	a 3	12	600	1,500	1,200	
2	2	San Miguel	San Miguel Springs	1868	T. 13 N., R. 8 W.	a 4	8	700	1,400	1,050	
1	1, 1	Private	San Miguel	1868	T. 13 N., R. 8 W.	3	3	200	400	300	
4	1, 2, 3, 4	do	Bluewater (San Jose)	1880	T. 12 N., R. 13 W.	a 2	8	150	450	450	
3	1, 2, 3	do	Gallinas Creek	1880	T. 10 N., R. 12 W.	a 2	6	320	960	960	
2	1, 2	do	Tenaja Creek	1880	T. 9 N., R. 12 W.	a 2	4	100	300	300	
2	5, 6	Bluewater Land and Irrigation Co.	Bluewater Creek and Reservoir.	1885	Sec. 8, T. 12 N., R. 11 W.	a 75	150	1,000	600	3,200	See note below.
1	1	San Rafael	Ojo del Gollo.	1870	Sec. 3, T. 10 N., R. 10 W.	12	12	600	1,200	900	

a Each.

List of ditches in District No. 10, New Mexico, Puerto—Continued.

Num- ber of ditches.	Number on stream.	Name.	Stream.	When built.	Approximate location of head.	Capac- ity.	Total capac- ity.	Acres irri- gated.	Acre-feet of water used.			Remarks.
									1894.	1895.	1896.	
1	7	Upper Acoma	Rio San Jose (Blue water).	Pueblo, very old.	Sec. 26, T. 10 N., R. 8 W.	Sec. 12	72	250	750	750	500	
2	8, 9	Lower Acoma and Laguna.	Rio San Jose	do	Sec. 30, T. 10 N., R. 7 W.	α 36	72	4,000	10,000	10,000	4,000	
1	1	Rinconada	Rinconada Creek	Before 1890	Sec. 35, T. 11 N., R. 8 W.	5	5	300	750	750	000	
1	1	San Jose Viejo	Rio del San Jose	do	Sec. 4, T. 10 N., R. 7 W.	5	5	300	750	750	000	
1	1	Cuervo	Cañon del Agua	Before 1890	Sec. 1, T. 10 N., R. 7 W.	20	20	1,000	1,500	1,500	1,000	
1	1	Ensenada	Ensenada Creek and Springs.	do	T. 10 N., R. 6 W.	5	5	300	000	000	450	
1	10	Ranchos Colorado	Rio San Jose	Pueblo, very old.	Sec. 2, T. 9 N., R. 5 W.	24	24	500	750	750	250	
1	11	El Rito	do	Before 1890	Sec. 18, T. 9 N., R. 4 W.	15	15	600	000	000	300	
62		Total					580	18,380	31,300	33,900	20,650	

α Each.

NOTE.—Prior to 1885, 290 acres was watered by an old ditch. Reservoir was built in 1894, and 1,000 acres watered in 1895, 600 in 1896. Company owns 2,000 acres, and 5,000 acres of good land can be watered from their ditches.

DISTRIBUTION OF WATERS OF THE RIO GRANDE.

List of ditches in District No. 11, Near Mexico—Salado to Berenda.

Num- ber of ditches.	Number on stream.	Name.	Stream.	When built.	Approximate location of head.	Capac- ity.	Total capac- ity.	Acre-feet of water used.			Remarks.
								1894.	1895.	1896.	
	1, 2	Private	Alamoedo Creek	Before 1890	T. 2 N., R. 6 W.	Sec. 6	300	300	300	150	Always poor wa- ter supply.
21	3, 4	Santa Rita	Rio Salado	Old	Sec. 14, T. 2 N., R. 4 W.	a 4	300	300	300	150	Do.
21 1/2	1 to 5	Cañada de Alamosa	Rio Alamosa	Before 1864	Ts. 10 and 11 S., R. 6 W.	a 4	600	1,200	1,200	900	
22	1, 2, 3	Private	Rio Cuchilla Negra	do	T. 12 S., R. 6 W.	a 3	300	900	900	400	
23	4	Cuchilla Negra	do	do	Sec. 24, T. 12 S., R. 6 W.	6	300	450	450	450	
1	1	Los Palomas	Springs in Rio Palo- mas.	1862	T. 13 S., R. 6 W.	12	300	540	540	540	
7	1 to 7	Private	Springs in Rio Los Animos.	1878	T. 15 S., R. 6 W.	a 2	14	500	500	500	
2	1, 2	do	Springs in Rio Per- ches.	1879	Sec. 15, T. 16 S., R. 7 W.	a 2	4	100	100	100	
2	1, 2	do	Springs in Cienega Apocle.	1870	Sec. 31, T. 16 S., R. 6 W.	a 2	4	120	120	120	
1	1	do	Springs in Berenda Wash.	1873	Sec. 12, T. 18 S., R. 7 W.	2	2	100	100	100	
26		Total					85	4,270	4,270	3,470	

a Each.

List of ditches in District No. 12, New Mexico, Española Valley.

Num- ber of ditches.	Number on stream.	Name.	Stream.	When built.	Approximate location of head.	Capac- ity.	Total capac- ity.	Acres-feet of water used.			Remarks.
								1894.	1895.	1896.	
2	1	Cremiculla	Springs on Rio Grande	About 1815	Sec. 25, T. 24 N., R. 11 E.	Sec. ft. a 2	Sec. ft. 4	260	260	260	
1	3	Rinconada	East side Rio Grande	1815	Sec. 12, T. 23 N., R. 10 E.	6	6	720	720	720	
1	4	West Rincoñada	West side Rio Grande	About 1815	Sec. 11, T. 23 N., R. 10 E.	4	4	400	400	400	
1	5	La Bolsa	East side Rio Grande	do	Sec. 21, T. 23 N., R. 10 E.	3	3	200	200	200	
1	6	Canova	West side Rio Grande	do	Sec. 3, T. 22 N., R. 9 E.	7	7	1,000	1,000	1,000	
1	7	Los Chicos	East side Rio Grande	Old	Sec. 3, T. 22 N., R. 9 E.	5	5	250	1,000	1,000	
1	8	La Joya del Medio	do	do	Sec. 3, T. 22 N., R. 9 E.	15	15	900	3,000	3,000	
1	9	Al Bosque	West side Rio Grande	do	Sec. 20, T. 23 N., R. 9 E.	7	7	1,120	1,120	1,120	
2	10	Private	do	do	Sec. 30, T. 23 N., R. 9 E.	a 3	6	200	800	800	
1	12	La Estaca	do	do	Sec. 20, T. 23 N., R. 9 E.	7	7	1,120	1,120	1,120	
1	13	Private	East side Rio Grande	do	Sec. 21, T. 23 N., R. 9 E.	4	4	200	800	800	
1	14	Alcalde	do	Probably 1800	Sec. 30, T. 23 N., R. 9 E.	30	30	1,500	6,000	6,000	
1	15	San Juan Pueblo	do	Pueblo, very old.	Sec. 35, T. 23 N., R. 8 E.	30	30	1,500	6,000	6,000	
1	16	Chamita	West side Rio Grande	Old	Sec. 35, T. 23 N., R. 8 E.	6	6	240	900	900	
1	24	San Jose	Chama River	do	Sec. 22, T. 23 N., R. 8 E.	65	65	6,000	6,000	4,000	
1	25	Chamita	do	Probably 1800	Sec. 22, T. 23 N., R. 8 E.	60	60	1,300	3,000	2,600	
1	26	Salazar	do	Before 1800	Sec. 5, T. 21 N., R. 8 E.	35	35	900	2,880	1,920	
1	5	Upper, on south side.	Santa Cruz River	Old	Sec. 8, T. 20 N., R. 9 E.	4	4	200	600	400	Watered 400 acres prior to 1885 (capacity 8 second feet).
1	6	Middle, on south side.	do	do	Sec. 12, T. 20 N., R. 9 E.	6	6	300	600	450	
1	7	Kitchener, on south side.	do	do	Sec. 12, T. 20 N., R. 9 E.	6	6	300	600	450	
1	8	Private, on south side.	do	do	Sec. 2, T. 20 N., R. 8 E.	3	3	100	200	150	
1	9	Santa Cruz	do	1800	Sec. 6, T. 20 N., R. 9 E.	36	36	1,100	2,200	1,650	
1	10	Private, north.	do	Old	Sec. 1, T. 20 N., R. 8 E.	12	12	330	700	520	
1	11	do	do	do	Sec. 1, T. 20 N., R. 8 E.	5	5	100	200	150	
1	17	Hobart	East side Rio Grande	do	Sec. 22, T. 20 N., R. 8 E.	10	10	100	200	300	Built in 1883, but covers land formerly watered by Santa Cruz, No. 5.
1	18	Santa Clara	West side Rio Grande	Pueblo, very old.	Sec. 15, T. 20 N., R. 8 E.	6	6	200	800	800	
2	1,2	do	Santa Clara Creek	do	Sec. 9, T. 20 N., R. 8 E.	a 6	12	300	600	300	

DISTRIBUTION OF WATERS OF THE RIO GRANDE.

1	19	South San Ildefonso.	Pojuaque Creek.....	do.....	Sec. 9, T. 19 N., R. 8 E.	8	480	480	480	240
1	20	North San Ildefonso.	do.....	do.....	Sec. 9, T. 19 N., R. 8 E.	4	240	240	240	120
32		Total				406	11,000	44,180	41,280	28,040

a Each.

List of ditches in District No. 13, New Mexico—Upper Albuquerque.

Number of ditches.	Number on stream.	Name.	Stream.	When built.	Approximate location of head	Capacity.	Total capacity.	Acre-feet of water used.			Remarks.
								1894.	1895.	1896.	
2	19, 20	Cochiti Pueblo	East and west side Rio Grande.	Pueblo, very old	Sec. 18, T. 16 N., R. 6 E.	Sec. ft. a 12	Sec. ft. 24	1,800	1,800	1,800	
1	21	Pena Blanca	East side Rio Grande	Before 1800	Sec. 18, T. 16 N., R. 6 E.	22	22	3,400	3,400	3,400	
1	22	Santo Domingo	do	Pueblo, very old	Sec. 26, T. 16 N., R. 6 E.	6	6	800	800	800	
2	23, 24	Santo Domingo, Lower.	do	do	Sec. 23, T. 15 N., R. 5 E.	a 4	8	800	800	800	
1	25	Sill.	West side Rio Grande	About 1820	Sec. 35, T. 16 N., R. 5 E.	5	5	800	800	800	
2	26, 27	San Felipe.	East and west side Rio Grande.	Pueblo, very old	Sec. 3, T. 14 N., R. 5 E.	a 10	20	2,000	2,000	1,500	
1	28	Algodones	East side Rio Grande	Before 1800	Sec. 19, T. 14 N., R. 5 E.	10	10	1,000	1,000	750	
1	29	Santa Ana	West side Rio Grande	Probably about 1810	Sec. 25, T. 14 N., R. 4 E.	13	13	1,320	1,320	900	
1	30	do	East side Rio Grande	do	Sec. 1, T. 13 N., R. 4 E.	13	13	1,320	1,320	900	
1	31	Bernalillo.	do	1700	Sec. 15, T. 13 N., R. 4 E.	25	25	2,500	2,500	1,800	
1	32	Sandia Pueblo.	do	Pueblo, very old	Sec. 31, T. 13 N., R. 4 E.	18	18	1,800	1,800	1,200	
1	33	Upper Corales.	West side Rio Grande	Before 1800	Sec. 25, T. 12 N., R. 3 E.	24	24	2,400	2,400	1,500	
1	34	Alameda	East side Rio Grande	do	Sec. 35, T. 12 N., R. 3 E.	25	25	2,500	2,500	1,800	
1	35	Los Ranchos	do	do	Sec. 3, T. 11 N., R. 3 E.	22	22	2,200	2,200	1,500	
1	36	Lower Corales	West side Rio Grande	do	Sec. 8, T. 11 N., R. 3 E.	8	8	800	800	500	
1	37	Los Griegos de Candelaria.	East side Rio Grande	do	Sec. 18, T. 11 N., R. 3 E.	21	21	2,100	2,100	1,300	
1	38	La Vereda.	do	do	Sec. 20, T. 11 N., R. 3 E.	20	20	2,000	2,000	1,250	
1	39	Duranes	do	1706	Sec. 28, T. 11 N., R. 2 E.	11	11	1,100	1,100	800	
1	40	Albuquerque	do	do	Sec. 1, T. 10 N., R. 2 E.	16	16	1,600	1,600	1,000	
23		Total					311	8,070	28,140	22,280	23,800

a Each.

List of ditches in District No. 14, New Mexico—Lower Albuquerque.

Number of ditches.	Number on stream.	Name.	Stream.	When built.	Approximate location of head.	Capacity.	Total capacity.	Acres irrigated.			Remarks.
								1894.	1895.	1896.	
1	41	Ranchar de Atenco.	West side Rio Grande	Before 1890.	Sec. 11, T. 10 N., R. 2 E.	9	Sec. ft.	140	420	500	
1	42	Upper Atenco.	do	do	Sec. 12, T. 10 N., R. 2 E.	36	.....	540	1,020	1,080	280
1	43	Middle Atenco.	do	do	Sec. 13, T. 10 N., R. 2 E.	20	.....	300	900	1,200	1,000
1	44	Lower Atenco.	do	do	do	63	.....	950	2,850	3,800	1,000
1	45	Acquia de Pajorito	do	do	Sec. 12, T. 9 N., R. 2 E.	65	.....	980	2,940	3,920	1,000
1	46	Los Padillos	do	do	Sec. 24, T. 9 N., R. 2 E.	40	.....	600	1,800	2,400	1,200
1	47	Isleta Pueblo	do	Pueblo, very old.	Sec. 12, T. 8 N., R. 2 E.	40	.....	600	1,800	2,400	1,200
1	48	Chical.	East side Rio Grande	do	Sec. 13, T. 8 N., R. 2 E.	21	.....	320	960	1,280	640
1	49	Pickory.	do	do	Sec. 24, T. 8 N., R. 2 E.	30	.....	420	1,260	1,680	840
1	50	Romero.	do	Before 1820	do	40	.....	600	1,800	2,400	1,200
1	51	Peralta	do	do	Sec. 35, T. 8 N., R. 2 E.	21	.....	320	960	1,280	640
1	52	Valencia	do	do	do	31	.....	460	1,380	1,840	920
1	53	Los Leutes	West side Rio Grande	do	do	40	.....	600	1,800	2,400	1,200
1	54	Los Lunas	do	do	do	73	.....	1,090	2,180	2,880	1,440
1	55	Huning's Mill and Irrigation.	do	1872.	Sec. 21, T. 7 N., R. 2 E.	80	.....	1,120	3,360	4,480	2,240
1	56	San Fernandez.	East side Rio Grande	Old	Sec. 23, T. 7 N., R. 2 E.	8	.....	120	360	480	240
1	57	Upper Toule.	do	do	do	9	.....	150	450	600	300
1	58	Los Chavez.	West side Rio Grande	do	Sec. 33, T. 7 N., R. 2 E.	30	.....	420	1,260	1,680	840
1	59	Lower Toule.	do	do	Sec. 3, T. 6 N., R. 2 E.	36	.....	540	1,620	2,160	1,080
1	60	Belen	West side Rio Grande	do	Sec. 4, T. 6 N., R. 2 E.	36	.....	540	1,620	2,160	1,080
1	61	La Sausal	do	do	Sec. 9, T. 6 N., R. 2 E.	30	.....	420	1,260	1,680	840
1	62	La Constantia	East side Rio Grande	Very old	Sec. 21, T. 6 N., R. 2 E.	35	.....	525	1,575	2,100	1,050
1	63	Acquia de los Inmigrantes.	West side Rio Grande	Old	Sec. 20, T. 6 N., R. 2 E.	35	.....	525	1,575	2,100	1,050
1	64	Casa Colorado.	East side Rio Grande.	do	Sec. 16, T. 5 N., R. 2 E.	35	.....	525	1,575	2,100	1,050
1	65	Jaroles.	West side Rio Grande	do	Sec. 8, T. 5 N., R. 2 E.	55	.....	825	2,475	3,300	1,650
1	66	Del Bosque	do	do	Sec. 20, T. 5 N., R. 2 E.	30	.....	420	1,260	1,680	840
1	67	Sabinal	do	do	Sec. 8, T. 4 N., R. 2 E.	30	.....	420	1,260	1,680	840
1	68	San Jose No. 1.	East side Rio Grande	do	Sec. 8, T. 4 N., R. 2 E.	65	.....	975	2,925	3,900	1,950
1	69	San Jose No. 2.	do	1888.	Sec. 20, T. 4 N., R. 2 E.	30	.....	420	1,260	1,680	840
1	70	Las Nutrias	do	Old	Sec. 20, T. 4 N., R. 2 E.	27	.....	405	1,215	1,620	810
1	71	Picorcho	West side Rio Grande	1898	Sec. 7, T. 3 N., R. 2 E.	21	.....	315	945	1,260	630
1	72	Los Ranchos.	East side Rio Grande	Old	Sec. 18, T. 3 N., R. 2 E.	27	.....	405	1,215	1,620	810
1	73	La Joya.	do	do	Sec. 25, T. 3 N., R. 1 E.	35	.....	525	1,575	2,100	1,050
28	Totals.					1,108		17,840	48,880	62,070	26,940

All this land formerly watered by San Jose No. 1.

DISTRIBUTION OF WATERS OF THE RIO GRANDE.

260

List of ditches in District No. 15, New Mexico—Socorro.

Num- ber of ditches.	Number on stream.	Name.	Stream.	When built.	Approximate location of head.	Ca- pac- ity.	Total capac- ity.	Acres irri- gated.	Acre-feet of water used.			Remarks.
									1894.	1895.	1896.	
1	74	San Geronimo	West Side Rio Grande.	Old	Sec. 32, T. 2 N., R. 1 E.	Sec. 11, 6		90	270	270	220	
1	5	San Aracilo	do	do	Sec. 31, T. 1 N., R. 1 W.	14		650	1,950	1,950	1,580	
1	6	Polviera	do	do	Sec. 31, T. 1 N., R. 1 W.	12		500	1,500	1,500	1,250	
1	7	Lemitar	do	do	Sec. 12, T. 1 S., R. 1 W.	42		1,000	3,000	3,000	2,560	
1	8	Socorro	do	do	Sec. 2, T. 2 S., R. 1 W.	40		600	1,800	1,800	1,250	
1	9	Publicito	East Side Rio Grande	do	Sec. 28, T. 2 S., R. 1 E.	5		150	380	450	300	
1	80	Lotiller	West Side Rio Grande.	do	Sec. 29, T. 2 S., R. 1 E.	22		600	1,500	1,800	1,200	
1	1	Cuba	do	do	Sec. 8, T. 3 S., R. 1 E.	8		200	500	600	400	
1	2	San Antonio	do	Before 1855.	Sec. 8, T. 4 S., R. 1 E.	26		450	1,120	1,350	900	
1	3	Bosquesito	East Side Rio Grande	do	Sec. 8, T. 4 S., R. 1 E.	15		250	250	600	400	
1	4	San Pedro	do	do	Sec. 8, T. 4 S., R. 1 E.	28		400	1,000	1,200	800	
1	5	San Antonio	West Side Rio Grande.	1881	Sec. 32, T. 4 S., R. 1 E.	12		150	370	450	300	
1	6	Volverde	East Side Rio Grande	Before 1869	Sec. 10, T. 7 S., R. 1 W.	16		200	500	600	400	
1	7	San Marcial	West Side Rio Grande.	do	Sec. 17, T. 7 S., R. 1 W.	16		200	500	600	400	
1	8	La Mesa	East Side Rio Grande	do	Sec. 20, T. 7 S., R. 1 W.	14		200	500	600	400	
1	9	Centidero	do	1863	Sec. 19, T. 7 S., R. 1 W.	14		200	500	600	400	
16		Total				300		5,790	15,640	17,370	12,650	

List of ditches in District No. 16, New Mexico—Rincon.

Num- ber of ditches.	Num- ber of on stream.	Name.	Stream.	When built.	Approximate location of head.	Capac- ity.	Total capac- ity.	Acres irri- gated.	Acres feet of water used.			Remarks.
									1894.	1895.	1896.	
1	90	Paraje	East side Rio Grande	1863	Sec. 26, T. 8 S., R. 2 W.	Sec. 21	Sec. 21	300	750	900	600	
1	1	Fort Craig	West side Rio Grande	1867	Sec. 21, T. 8 S., R. 2 W.	4	4	50	120	150	100	
1	2	Carrizosa	do	1869	Sec. 6, T. 9 S., R. 3 W.	11	11	200	500	600	400	
1	7	San Jose Plaza	do	Before 1864	Sec. 4, T. 10 S., R. 3 W.	14	14	300	750	900	600	
1	4	San Albino	East side Rio Grande	do	Sec. 10, T. 10 S., R. 3 W.	10	10	200	500	600	400	
1	5	Mitchell	West side Rio Grande	1884	Sec. 8, T. 11 S., R. 3 W.	11	11	250	620	750	500	But 100 acres wa- tered in 1896.
2	96, 97	Gonzales	East and west side Rio Grande.	1884	Sec. 5, T. 12 S., R. 3 W.	6 3	6	90	220	270	180	Washed out and abandoned in 1884.
2	98, 99	Padomitas and Hot Springs.	West side Rio Grande	1870	—, T. 14 S., R. 4 W.	18		900				Failure.
1	100	Greenhorn.	do	1865	Sec. 6, T. 16 S., R. 4 W.	10	10	60		180	120	Do.
1	1	Sierra	do	1866	Sec. 18, T. 16 S., R. 4 W.	10	10	200		600	800	Good ditch; 200 acres watered in 1895.
1	2	Arroyo Bonito	do	1865	Sec. 35, T. 16 S., R. 5 W.	24	24	400				200 acres in 1895; 1,000 in 1894; 2,500 in 1896.
1	3	Loma Padre	East side Rio Grande	1865	Sec. 29, T. 17 S., R. 5 W.	100	100	3,000	2,500	5,500	7,200	
1	4	Colorado Plaza	West side Rio Grande	1870	Sec. 27, T. 18 S., R. 4 W.	60	60	4,000	10,000	12,000	6,000	Watered 250 acres prior to 1890.
1	5	East Colorado	East side Rio Grande	1870	Sec. 31, T. 18 S., R. 3 W.	10	10	100	250	300	150	Watered 50 acres in 1896.
1	6	Private	West side Rio Grande	1865	Sec. 17, T. 19 S., R. 2 W.	4	4	100		150	120	
17		Total					265	9,850	16,210	27,510	16,900	

a Each.

DISTRIBUTION OF WATERS OF THE RIO GRANDE.

2402

List of ditches in District No. 17, New Mexico—Mesilla Valley.

Num- ber of ditches.	Number on stream.	Name.	Stream.	When built.	Approximate location of head.	Ca- pa- city, cu. ft.	Total capa- city, cu. ft.	Acres irri- gated.	Acres-foot of water used.			Remarks.
									1894.	1895.	1896.	
1	107	Doña Ana	East side Rio Grande	1844	Sec. 24, T. 21 S., R. 1 W	s. 70	.....	4,000	11,500	11,500	11,500	About 7,000 acres wa- tered prior to 1867; then gradually in- creased to 1884. Has same head in 1887; water divided equally since 1884. 4,000 acres watered in 1888.
1	108	Las Cruces	do	1849	Sec. 4, T. 22 S., R. 1 E	125	.....	6,000	13,750	13,750	13,750	
1	109	La Mesilla	do	1850	Sec. 4, T. 22 S., R. 1 E	125	.....	5,000	13,750	13,750	13,750	
1	110	Picacho	West side Rio Grande	1850	Sec. 4, T. 23 S., R. 1	.....	.....	(2,500)	.....	.....	.....	Increase has been gradual. A ban- doned 1880; land now vacant.
1	111	San Miguel	do	1857	Sec. 19, T. 24 S., R. 2	60	.....	1,500	3,750	3,750	3,000	Washed out in 1884 and not used until 1890. Since 1890 takes water from San Miguel. Prior to 1884 served 1,250 acres.
1	112	Santa Tomas	do	1857	Sec. 20, T. 24 S., R. 2	10	.....	500	1,250	1,250	1,000	
1	113	Mesquite	East side Rio Grande	About 1875	Sec. 36, T. 24 S., R. 2	10	.....	500	1,250	1,250	1,000	Poor ditch. Until 1860 part of San Miguel.
1	114	La Mesa	West side Rio Grande	1857	Sec. 28, T. 24 S., R. 2	60	.....	1,500	3,750	3,750	3,000	Prior to 1884, 3,000 acres; 1885 to 1888, 2,000 acres. Then increase gradual.
1	115	Chambarino	do	1864	Sec. 13, T. 25 S., R. 2	75	.....	3,000	7,250	7,250	4,500	1,000 acres served 1888-89-90. Prior to 1884, 4,000 acres watered; since 1884, 800 to 400 in 1890.
1	116	Anthony	East side Rio Grande	1887	Sec. 5, T. 25 S., R. 3	30	.....	500	1,250	1,250	750	
1	117	Old La Union	West side Rio Grande	1852	Sec. 8, T. 26 S., R. 3	18	.....	400	1,000	1,000	000	
1	118	New La Union	East side Rio Grande	1892	Sec. 8, T. 26 S., R. 3	90	.....	3,000	0,500	9,000	5,400	1892, 600 acres; 1893, 1,000 acres; 1894, 2,000 acres; 1895, 3,000 acres; still in- creasing.
12		Total				679	.....	27,100	65,000	67,750	59,250	

NOTE.—See next sheet for acres served by these ditches since 1880.

Areas watered by ditches in District No. 17, New Mexico—Mesilla Valley.

No. of ditch.	Prior to 1880.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.
107.....	7,000	7,000	7,000	7,000	6,000	6,200	5,800	5,400	5,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000
108.....	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000
109.....	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,150	4,300	4,450	4,650	4,800	5,000	5,000	5,000
110.....	2,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
111.....	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
112.....	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
113.....	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
114.....	3,000	3,000	3,000	3,000	3,000	3,000	2,000	2,000	2,000	2,000	2,100	2,250	2,400	2,650	2,800	2,900	3,000	3,000
115.....	4,000	4,000	4,000	4,000	4,000	4,000	800	800	700	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
116.....	4,000	4,000	4,000	4,000	4,000	4,000	800	800	700	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
117.....	4,000	4,000	4,000	4,000	4,000	4,000	800	800	700	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
118.....	4,000	4,000	4,000	4,000	4,000	4,000	800	800	700	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Total.....	31,200	28,700	28,700	28,700	28,300	27,900	22,100	21,700	21,700	21,800	21,950	22,650	22,700	23,500	24,700	26,000	27,100	27,100

Reservoirs already built in the Rio Grande drainage.

No.	When built.	Name.	Location.	Source of supply.	Capacity.	Remarks.
1	1894	Saguache.....	T. 44 N., R. 8 E., District 20, Colo.	Saguache Creek.....	<i>Acres feet</i> 1,200	Water supply not sufficient to fill this; probably a failure.
2	1883	Cove Lake.....	7 miles east of Antonito, District 22, Colo.	Concepcion and San Antonio.	9,700	Filled through Taos Valley Canal No. 3; only small amount of land can be served by it; none watered up to fall of 1886.
3	1883	Santa Fe.....	3 miles east of Santa Fe, District 7, N. Mex.	Santa Fe Creek.....	400	Used for city supply and for irrigation.
4	1891	Blowwater.....	T. 12 N., R. 12 W., District 10, N. Mex.	Blowwater Creek.....	20,000	This can be increased to 70,000 acre-feet, but in 1886 there was not water enough in the drainage to fill it to its present capacity.
		Total.....			31,300	

Reservoirs projected with a fair prospect of construction.

No.	Name.	Location.	Source of supply.	Capacity.	Remarks.
1	Santa Maria lakes.....	T. 41 N., R. 2 W., District 23, Colo.	Rio Grande.....	<i>Approx.</i> 20,000	
2	Mormon.....	5 miles northwest of An- derson, District 22, Colo.	Concejos River.....	20,000	
3	Western Homestead L. & I Co.....	T. 13 N., R. 2 W., District 10, N. Mex.	Rio Puerco.....	20,000	
4	Elephant Butte.....	T. 12 and 13 S., R. 2 W., District 16, N. Mex.	Rio Grande.....	255,000	
	Total.....			295,000	

Reservoir sites which may some time be improved.

No.	Name.	Location.	Source of supply.	Capacity.	Remarks.
1	La Jara Meadow.....	T. 35 N., R. 6 E., district 21, Colo.	La Jara Creek.....	<i>Approx.</i> 20,000	Water would be used in district No. 21, Colorado.
2	Elk Creek Meadow.....	T. 33 N., R. 6 E., district 22, Colo.	Elk Creek.....	8,000	Water would be used in district No. 22, Colorado.
3	Pinos Creek Meadow.....	T. 33 N., R. 5 E., district 22, Colo.	Pinos Creek.....	5,000	Do.
4	Brazos Lakes.....	T. 29 N., R. 6 E., district 2, N. Mex.	South Fork Brazos Creek.....	20,000	Water would be used in Tierra Amorrillia, N. Mex. Reservoir could be built to hold 25,000 acre-feet, but it is not likely that the water supply will be over 20,000 acre feet.
5	Hot Springs Military Reservation.....	T. 8 S., R. 7 W., district 11, N. Mex.	Rio Alamosa.....	20,000	A very good site, but water supply not certain; 400 square miles of drainage; no snow.
6	Old Fort Craig.....	T. 9, 10 S., R. 2 and 3 W., district 16, N. Mex.	Rio Grande.....	300,000	It is highly likely that both this and the Elephant Buttes dam would ever be built.
	Total.....			433,000	

DISCHARGE OF THE RIO GRANDE

AT

DEL NORTE, COLORADO.

(DRAINAGE AREA, 1,400 SQUARE MILES.)

Month.	Maximum. Sec. ft.	Minimum. Sec. ft.	Mean. Sec. ft.	Total for month. Acres ft.
1889.				
October 11 to 31	345	214	278	17,097
November	364	290	319	18,980
December	364	200	281	17,281
1890.				
January	1,000	326	552	33,948
February	896	745	796	44,178
March	842	404	487	29,950
April	1,380	404	813	54,323
May	5,930	1,990	4,331	266,356
June	5,555	2,550	3,807	226,516
July	2,260	862	1,515	93,172
August	930	450	612	37,638
September	450	326	383	22,788
October	862	307	470	28,905
November	610	345	478	28,441
December	670	475	565	34,747
Per annum	5,930	907	1,242	900,962
1891.				
January	1,320	670	990	60,885
February	1,410	1,196	1,294	71,817
March	1,460	930	1,280	78,720
April	3,160	796	1,410	83,895
May	5,650	1,860	3,245	202,027
June	5,555	2,190	4,146	246,687
July	3,565	862	1,693	104,119
August	1,460	404	663	40,774
September	1,234	290	527	31,356
October	2,475	450	844	51,906
November	450	308	374	22,253
December			6325	19,987
Per annum	5,650	290	1,403	1,014,426
1892.				
January			a 300	18,450
February			a 300	17,250
March 22 to 31	345	290	316	19,434
April	2,400	345	1,047	62,296
May	4,710	1,510	2,605	160,207
June	3,160	1,152	1,287	130,126
July	1,074	554	740	45,510
August	610	308	444	27,306
September	298	243	262	15,589
October	290	243	259	15,928
November	829	243	360	21,420
December	1,074	862	922	56,705
Per annum	4,710	240	1,812	590,219

a Estimated.

IRRIGATION AND WATER RIGHTS.

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Month.	Maximum. Sec. ft.	Minimum. Sec. ft.	Mean. Sec. ft.	Total for month. Acre ft.
1893.				
January.....	1,113	862	966	59,409
February.....			a 700	38,850
March.....			a 500	30,750
April.....	1,037	326	533	31,714
May.....	3,320	732	1,944	119,556
June.....	2,850	670	1,749	104,066
July.....	640	290	395	24,292
August.....	450	258	324	19,926
September.....	345	228	270	16,065
October.....	308	243	263	16,175
November.....	450	214	278	16,600
December.....	862	228	642	39,483
Per annum.....	3,320	214	714	516,896
1894.				
January.....	1,370	1,080	1,213	75,200
February.....	1,200	1,120	1,200	67,200
March.....	1,370	550	1,015	62,930
April.....	2,010	550	860	51,600
May.....	4,560	1,510	2,510	155,620
June.....	1,840	450	960	58,800
July.....	490	300	355	22,010
August.....	550	300	380	23,560
September.....	490	260	345	20,600
October.....	450	300	345	21,300
November.....	300	235	270	16,200
December.....	240	665	300	22,330
Per annum.....	4,560	235	818	597,440
1895.				
January.....	894	680	801	49,252
February.....	1,061	894	953	52,927
March.....	960	403	638	39,229
April.....	3,129	650	1,883	112,047
May.....	3,129	1,382	2,116	130,108
June.....	3,804	1,172	2,399	131,445
July.....	1,252	770	958	58,905
August.....	960	566	720	44,271
September.....	566	376	454	27,015
October.....	484	403	435	26,747
November.....	403	322	353	21,005
December.....	1,212	403	1,008	61,980
Per annum.....	3,804	322	1,044	754,331
1896.				
January.....	1,428	1,172	1,293	79,504
February.....	2,154	960	1,258	72,361
March.....	1,336	830	1,081	66,469
April.....	3,054	594	1,484	88,204
May.....	3,579	1,212	2,374	145,973
June.....	1,796	430	821	48,853
July.....	650	322	403	24,780
August.....	403	214	261	16,048
September.....	1,294	268	477	28,383
October.....	566	403	459	28,838
November.....	376	268	310	18,446
December.....	430	322	375	23,058
Per annum.....	3,579	214	884	641,017
1897.				
January.....	1,120	465	911	56,480
February.....	1,275	1,150	1,209	33,832

a Estimated.

Month.	Maximum. Sec. ft.	Minimum. Sec. ft.	Mean. Sec. ft.	Total for month. Acre ft.
1897—Continued.				
March	1,375	590	856	53,072
April	1,800	530	1,025	61,380
May	5,250	1,720	3,536	219,356
June	4,870	1,580	3,229	197,940
July	2,140	595	1,094	67,828
August	630	300	457	28,354
September	990	290	635	38,109
October	2,100	810	1,371	85,002
November	890	540	686	41,160
December	1,280	750	1,036	64,232
Per annum	5,250	290	1,343	316,736

Three stations have been maintained in New Mexico, at Embudo, Rio Grande, and San Marcial. The Embudo station is important, inasmuch as it furnishes the record of the flow of the Rio Grande before the diversion of its waters in New Mexico. I herewith give tables of discharge showing this flow.

DISCHARGE OF RIO GRANDE AT EMBUDO, N. M.

(DRAINAGE AREA, 7,000 SQUARE MILES.)

Month.	Maximum. Sec. ft.	Minimum. Sec. ft.	Mean. Sec. ft.	Total for month. Acre ft.
1889.				
January	495	379	431	26,506
February	576	420	473	26,251
March	1,042	537	784	48,215
April	4,420	970	2,261	134,530
May	5,075	2,443	3,430	210,945
June	5,660	1,390	2,922	173,859
July	1,105	236	471	28,966
August	253	181	206	12,669
September	264	184	212	12,614
October	324	243	283	17,404
November	507	253	366	21,777
December	610	364	542	33,333
Per annum	5,660	181	1,032	747,070
1890.				
January	617	260	437	26,875
February	670	344	554	30,091
March	1,044	330	682	41,943
April	3,220	842	2,083	123,938
May	6,071	2,660	4,900	305,040
June	5,740	2,768	4,107	244,366
July	2,640	920	1,593	97,909
August	1,134	636	814	50,061
September	1,044	496	545	32,427
October	606	523	562	34,563
November	699	550	616	36,632
December	660	636	648	39,832
Per annum	6,071	260	1,467	1,064,377
1891.				
January	666	550	586	36,039
February	1,000	550	616	34,182
March	1,450	735	917	56,395
April	5,690	795	2,570	141,015
May	8,550	4,530	5,365	366,847
June	6,340	4,325	5,040	299,880
July	4,130	1,250	2,356	144,894
August	1,805	320	933	57,379
September	2,025	320	409	27,905

IRRIGATION AND WATER RIGHTS.

Month.	Maximum. Sec. ft.	Minimum. Sec. ft.	Mean. Sec. ft.	Total for month. Acre ft.
1891—Continued.				
October.....	3,350	225	1,681	103,381
November.....	970	515	778	46,291
December.....	880	340	553	34,009
Per annum.....	8,560	225	1,855	1,348,217
1892.				
January.....	615	140	497	30,565
February.....	700	490	596	34,270
March.....	1,550	700	1,051	61,656
April.....	4,910	820	2,979	177,250
May.....	6,665	4,130	4,890	300,735
June.....	4,715	1,550	3,146	187,187
July.....	1,400	280	3,538	33,087
August.....	300	152	191	11,746
September.....	165	140	152	9,044
October.....	260	165	202	12,423
November.....	400	243	317	18,861
December.....	490	165	324	19,926
Per annum.....	6,665	140	1,240	899,730
1893.				
January.....	360	280	332	20,418
February.....	465	340	415	25,033
March.....	2,670	360	501	30,812
April.....	2,465	700	1,436	85,142
May.....	5,105	1,500	3,119	191,819
June.....	3,740	540	2,353	150,714
July.....	1,150	130	226	13,899
August.....	565	110	290	14,145
September.....	440	225	287	17,077
October.....	420	340	363	22,325
November.....	.....	.....	a 450	27,000
December.....	.....	.....	a 445	27,590
Per annum.....	.....	.....	862	624,274
1894.				
January.....	.....	.....	435	26,970
February.....	.....	.....	450	25,200
March.....	.....	.....	a 500	31,000
April.....	.....	.....	.....	.....
May.....	.....	.....	.....	.....
June.....	.....	.....	.....	.....
July.....	.....	.....	.....	.....
August.....	.....	.....	.....	.....
September.....	.....	.....	155	9,300
October.....	.....	.....	229	14,198
November.....	.....	.....	340	20,400
December.....	.....	.....	338	20,956
1895.				
January.....	552	432	475	29,207
February.....	672	420	503	27,935
March.....	1,410	640	759	46,546
April.....	4,290	592	2,541	151,200
May.....	4,290	1,573	2,679	164,725
June.....	4,985	790	3,021	179,762
July.....	2,530	612	1,335	82,086
August.....	2,016	652	1,080	66,107
September.....	1,146	480	636	37,845
October.....	572	460	494	30,375
November.....	700	540	611	36,357
December.....	580	420	534	32,834
Per annum.....	4,985	420	1,222	885,279

a Estimated.

Month.	Maximum. Sec. ft.	Minimum. Sec. ft.	Mean. Sec. ft.	Total for month. Acre ft.
1896.				
January.....	660	460	532	32,712
February.....	640	480	551	31,694
March.....	2,100	580	957	58,844
April.....	2,720	1,200	1,797	106,929
May.....	2,980	850	1,598	98,259
June.....	990	210	367	21,838
July.....	1,380	210	299	18,385
August.....	310	210	249	15,310
September.....	580	210	228	13,570
October.....	1,090	275	349	21,450
November.....	600	210	395	23,504
December.....	500	380	414	25,456
Per annum.....	2,980	210	645	467,960
1897.				
January.....	410	375	384	23,826
February.....	475	375	407	22,832
March.....	865	410	561	34,784
April.....	3,178	700	1,691	101,134
May.....	8,745	3,178	5,443	337,450
June.....	7,600	2,270	4,596	275,788
July.....	1,925	345	1,248	77,268
August.....	1,015	285	338	20,379
September.....	460	285	344	20,660
October.....	2,150	495	1,535	95,150
November.....	1,435	745	1,137	68,290
December.....	745	415	548	33,900
Per annum.....	8,745	285	1,519	1,112,382

The Rio Grande station is located at the upper end of White Rock cañon and is the most important in New Mexico. It was established in February, 1895, and shows the great influence on the flow of the Rio Grande of the Chama, the Santa Cruz, Nambé, and other streams entering the river in its passage through the Espanola valley. Its record is as follows:

DISCHARGE OF RIO GRANDE AT RIO GRANDE, NEW MEXICO.

Month.	Maximum. Sec. ft.	Minimum. Sec. ft.	Mean. Sec. ft.	Total for month. Acre ft.
1895.				
January.....				a 34,463
February.....	1,440	355	591	32,822
March.....	2,640	730	1,371	84,294
April.....	8,630	1,610	5,073	301,864
May.....	6,655	2,420	4,616	283,827
June.....	7,200	1,120	4,630	275,504
July.....	4,430	1,065	1,508	108,710
August.....	2,490	705	1,481	91,063
September.....	1,160	530	723	43,021
October.....	880	630	707	43,472
November.....	940	655	834	49,626
December.....	855	605	713	43,841
Per annum.....	8,630	355	2,046	1,392,507
1896.				
January.....			a 600	36,896
February.....			a 600	34,512
March 4 to 31.....	3,015	675	1,355	75,264
April.....	5,140	1,810	3,483	207,253
May.....	5,250	1,265	2,704	166,263

a Estimated.

IRRIGATION AND WATER RIGHTS.

27851

Month.	Maximum. Sec. ft.	Minimum. Sec. ft.	Mean. Sec. ft.	Total for month. Acre ft.
1896.—Continued.				
June	1,680	255	535	31,833
July	920	255	412	25,333
August	310	210	243	14,942
September	735	255	299	17,792
October	617	350	461	28,346
November	617	310	458	29,633
December	645	330	488	30,066
Per annum	5,250	210	973	608,072
1897.				
January	570	300	472	25,280
February	590	470	541	30,320
March	2,485	610	985	61,480
April	9,220	1,200	5,056	303,350
May	15,340	8,500	11,454	710,120
June	10,900	2,480	6,153	369,180
July	3,190	200	1,580	98,180
August	1,255	240	458	28,380
September	2,360	360	650	38,980
October	3,465	780	2,227	138,080
November	1,710	680	1,208	72,480
December	745	350	536	33,230
Per annum	15,340	200	2,610	1,909,060

The station at San Marcial has been maintained since 1895, but owing to the shifting bottom results have been obtained with difficulty. This station demonstrates the influence of the flood-water flow on the discharge of the Rio Grande, there being no permanent streams entering the river between Rio Grande station and San Marcial, and the spring flow, where there is any, being very small. In 1896 the record covers only the months from February to August, inclusive.

ESTIMATED MONTHLY DISCHARGE OF RIO GRANDE AT SAN MARCIAL, NEW MEXICO.

(DRAINAGE AREA, 28,067 SQUARE MILES.)

Month.	Maximum. Sec. ft.	Minimum. Sec. ft.	Mean. Sec. ft.	Total for month. Acre ft.
1895.				
February	1,755	280	986	53,760
March	3,115	1,350	2,096	128,879
April	7,800	2,180	4,689	279,014
May	6,265	2,085	3,625	222,892
June	5,958	1,080	3,922	233,375
July	7,339	960	2,431	149,476
August	6,265	1,210	2,913	179,113
Per annum	7,800	280	2,952	1,246,509
1896.				
January				a 25,000
February	885	580	680	39,144
March	2,200	240	679	41,750
April	4,800	1,400	3,142	186,962
May	4,800	195	2,019	124,143
June	820		164	9,759
July	4,800		466	28,633
August	820		118	7,255
September	1,500		130	7,735
October	11,300		742	45,624

a Estimated.

Month	Maximum. Sec. ft.	Minimum. Sec. ft.	Mean. Sec. ft.	Total for month. Acre ft.
1896.—Continued.				
November	495	15	209	12,444
December	829	460	619	38,060
Per annum	11,300		815	566,429
1897.				
January	600	200	318	19,624
February	600	350	434	24,350
March	1,350	350	660	40,950
April	7,025	900	3,584	315,060
May	22,250	6,150	12,173	754,700
June	11,112	1,775	6,156	369,350
July	2,025	270	1,117	69,250
August	365	5	101	6,230
September	6,050	5	1,907	114,412
October	15,500	650	4,619	286,400
November	3,500	2,100	2,953	177,200
December	3,100	2,400	2,484	154,000
Per annum	22,250	5	3,042	2,331,586

At El Paso, Texas, the river has been gauged at varying periods, but unfortunately the record is not continuous. This station is of as much or more importance than any of the others, as the data obtained here will be of the greatest importance in the adjustment of the conflicting water rights claimed by New Mexico, Texas, and the Republic of Mexico.

I present herewith all the data available on this subject.

DISCHARGE OF RIO GRANDE AT EL PASO, TEXAS.

(DRAINAGE AREA, 30,000 SQUARE MILES.)

Month.	Maximum. Sec. ft.	Minimum. Sec. ft.	Mean. Sec. ft.	Total for month. Acre ft.
1889.				
May 10 to June 31	4,705	2,000	3,116	191,634
June	4,400	600	2,638	156,961
July	930		237	14,555
August				
September				
October				
November				
December	252		71	4,366
1890.				
January	280	126	196	12,654
February	458	108	230	16,095
March	1,140	45	424	26,076
April	4,108	470	2,190	130,305
May	7,200	3,495	5,771	354,916
June	7,300	2,925	4,404	262,038
July	2,355	235	854	52,531
August	2,497	170	734	45,141
September	600	40	176	10,472
October	116	40	65	3,997
November	610	40	284	16,898
December	610	430	535	32,902
Per annum	7,200	40	1,327	963,415
1891.				
January	715	140	451	27,736
February	2,640	470	809	44,899

IRRIGATION AND WATER RIGHTS.

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Month.	Maximum. Sec. ft.	Minimum. Sec. ft.	Mean. Sec. ft.	Total for month. Acre ft.
1891.				
March	4,635	470	1,866	114,759
April	8,625	1,040	4,265	253,767
May	16,620	8,340	11,832	726,328
June	8,340	5,045	6,714	399,483
July	6,345	610	2,271	139,366
August	1,785	17	662	40,713
September	9,480	.....	768	45,695
October	3,535	560	1,488	91,512
November	515	235	341	20,289
December	560	190	344	21,156
Per annum	16,620	.....	2,653	1,926,293
1892.				
January	470	155	326	20,049
February	830	290	476	27,370
March	2,070	390	752	46,248
April	7,485	470	3,147	187,246
May	10,050	5,205	7,093	436,219
June	6,484	560	2,943	175,108
July	2,500	.....	668	41,082
August	140	.....	13	800
September .....	.....	.....	.....	.....
October .....	.....	.....	.....	.....
November .....	.....	.....	.....	.....
December .....	.....	.....	.....	.....
Per annum	10,050	.....	1,285	934,122
1897.				
January	1,260	90	395	18,753
February	230	125	194	10,774
March	120	30	72	4,427
April	4,225	40	1,740	103,537
May	17,000	5,000	8,312	511,088
June	11,000	2,000	6,095	362,678
July	5,300	300	1,330	81,775
August	600	.....	132	8,117
September	2,880	.....	705	41,960
October	5,000	230	1,758	108,095
November	1,625	810	1,132	67,358
December	1,015	460	680	41,812
Per annum	17,000	.....	1,871	1,360,374

SUMMARY.

Year.	Del Norte.	Gain or loss. Per cent.	Embujo.	Gain or loss. Per cent.	Rio Grande.	Gain or loss. Per cent.	San Mar- cial.	Gain or loss. Per cent.	El Paso.
1889 .....	.....	.....	747,070	.....	.....	.....	.....	.....	.....
1890	900,962	+18	1,064,377	.....	.....	.....	.....	.....	963,415
1891	1,014,426	+32	1,348,217	.....	.....	.....	.....	+42	1,926,293
1892	590,219	+52	899,730	.....	.....	.....	.....	+63	934,122
1893	516,886	+20	624,274	.....	.....	.....	.....	.....	.....
1894	597,440	.....	.....	.....	.....	.....	.....	.....	.....
1895	754,931	+17	885,279	+57	1,392,567	.....	.....	.....	.....
1896	641,017	+23	467,960	+47	638,072	-19	566,499	.....	.....
1897	946,737	+17	1,112,382	+71	1,909,060	+22	2,331,586	-41	1,360,374